



# Increasing Basic Mathematics Ability Using Manipulative Media

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This research was aimed at increasing basic mathematics ability in numerical operations aspects of B level students at Prosperous I Kindergarten in Panggarangan using manipulative media. It was carried out in April to May 2019. The action research of Kemmis and Taggart was used as the method of the research. It applied two cycles with 12 meetings. The cycles consist of planning, acting, observing, and reflecting. The subject of the research were 13 kindergarten level B students of Prosperous I Panggarangan. The data obtained were the assessment results of pre-cycle, cycle I and cycle II, field notes, interviews, and documentation. Emills standard was used to analyse the data percentage. The average increase of basic mathematics ability in numeral operation aspects reached 71%. The result of the research shows that there was an increase in basic mathematics ability using manipulative media. It was proven by the increase of students' average assessment results. In cycle I the students' average score was 27.7, in cycle II it was 32.2. This means that there was an increase of 4.5 in the average score, from 76.9% in cycle I to 89.5% in cycle II. The implication of this study is that the use of manipulative media to teach basic mathematics in numerical operations brought about good results. In the learning process, the students become more active and creative. They found it easier to learn some mathematics concepts. In teaching mathematics concepts, manipulative media helped ease the teacher in explaining the concepts.

**Key words:** *Mathematics, Ability, Manipulative Media.*

## Introduction

Early childhood education is essentially education that is organized with the aim of facilitating children's growth and development. Anderson said education at an early age needs to provide various activities that can develop various aspects of development, which



encompasses cognitive, language, social, physical and motor skills. In law No. 20 of 2003 concerning the national education system, relating to Early Childhood Education, Chapter 1, article 1, paragraph 1 reads, "Early Childhood Education is held for children from birth to six years conducted through the provision of educational stimuli, to help growth and physical and spiritual development, so that children have readiness to enter further education." The function of education for young children is not just to provide a variety of experiences, but also to optimize the development of intelligence capabilities. Children's intelligence capabilities can develop optimally when families and schools are able to provide appropriate stimulation programs for children. Appropriate stimulation programs for children are programs that place children as centres in learning. Learning for children involves learning-oriented developmental characteristics and the learning needs of children. Every child's learning needs will not be the same. This is because of their different developmental characteristics, by which each child has their own uniqueness. The importance of early age and the accompanying characteristics require that the approach used in learning must be child-centred. The role of education in learning activities is to provide and enrich learning opportunities and experiences for children. Efforts to provide and enrich opportunities and learning experiences for children is to provide flexibility and opportunities for the child to perform a variety of activities, so that they may construct their own knowledge by way of exploring the environment, as well as through active interaction both with peers and with other adults.

Development of children's intelligence capabilities is done through the provision of stimulation in accordance with the characteristics of child development and includes all aspects of its development. Cognitive ability is one of the aspects of child development that are related to intellectual ability. Cognitive abilities and other abilities in child development need to get stimulation early on, especially during the golden age. The proper stimulation provided by both teachers and parents at home will have an impact on the formation of children in the future. One of the stimulations that can improve children's cognitive abilities is through early mathematics learning.

Learning mathematics in children of an early age will need to be packaged differently. Learning is designed with the feel of the play, as well as through use of media that can be manipulated to allow the child to learn a variety of mathematical concepts. Educators of children need to provide a conducive environment for children. An environment conducive to early childhood learning begins with placing the child as a subject of learning, and by providing materials, methods and media, appropriate for children. As often occurs in the field, learning for young children is designed to be scholastic, which situates the child as an object of learning, depriving them of the freedom to explore the environment and construct their own knowledge. In addition, media is not used enough in early learning. Especially in



the beginning of mathematics learning in children aged 5-6 years, this has an impact on the low mathematical abilities of children.

### **Study Theory and Research Methods**

Learning mathematics is basically learning to think or learn to solve problems. According to Dodge and Colker mathematics is the ability to think logically, to solve problems, and perceive relationships. To become mathematical thinkers children need to be given the freedom to investigate and organize concrete objects before they can use symbols that they have known in abstract terms. Jo Ann Brewer states that, "mathematics is a way of viewing the world and their experiences in it. It is understanding of numbers, operations on numbers, functions and relations, probability, and measurement." This suggests that mathematics is a way to learn life through experience, while what is learned in mathematics are numbers, operations, functions, relationships, possibility, and measurement.

Copley said, "Mathematics is essentially the search for sense and meaning, patterns and relationships, order and predictability." Mathematics is the study of patterns, relationships, sequences and possibilities. From this opinion it can be seen that learning mathematics in children aged 5-6 years is learning about patterns, relationships, sequences and possibilities. The same thing is in the Benchmark, which states that, "Mathematics is the study of many kinds of patterns, including numbers and shapes and operations on them. Sometimes patterns are studied because they help to explain how the world works or how to solve practical problems, sometimes because they are interesting in themselves." Mathematics is the science of various patterns, including numbers, shapes, and operations. Patterns that are learned by children function to teach them how to solve problems.

Number operations is one part of the mathematical aspects studied by children aged 5-6 years. According to Kellough's Number operations: in addition to rational counting, other concepts are associated with the understanding of whole numbers, including conservation of numbers, seriation, logical classification, and class inclusion (1996: 211). Counting among children aged 5-6 years, is an ability that must be mastered by children alongside the concept of number operations. Another opinion related to the ability to recognize number operations in children aged 5-6 years was raised by Charlesworth & Lind who stated that:

Count anything and everything to help children use review their own experience with the object. To better understand numbers, throughout the day sing number songs, repeat finger-plays and rhymes, flannel board number share, number share stories, and read books that include counting. Counting with young children starts with the ability to recite names of numbers in order. Rational counting requires children to match each numerals in name, in order, to an object in group "to count objects accurately the child must know the numeral



names in the correct order and be able to coordinate eyes, hands, speech, and memory (2009: 159).

Number operations in children is the ability to tell the name of the numbers in sequence. Numeracy requires the child to understand the number of an object in the group. Activity counting in children will be meaningful if learning is associated with children's daily lives through counting objects evident in the environment around them. According to Copeland, children recognize numbers when through direct directly or by being actively involved in activities, such as counting. Kamariyah, in Susilawati (2015), states that calculation teaching in children aged 5-6 years will be more meaningful when the activity is associated with a real object, or the everyday life of the child. For example, when the teacher wants to teach the concept of three numbers, the teacher shows objects that number three, and shows the symbol of number 3, as well as when the teacher wants to introduce the concept of other numbers.

A similar opinion was expressed by Copley. Researchers have determined that finger counting plays an important role in the development of the mathematical understanding of young children. Using fingers to count, compare and perform simple operations can provide children with a basis for understanding numbers up to 10 (2001).

The game of counting using fingers is very important for children in understanding mathematics related to the introduction of the concept of numbers from 1 to 10. In these terms, learning to count in children aged 5-6 years is the beginning of numeracy learning, where children are introduced to the concept of numbers and the symbol of numbers from 1-10. Learning activities regarding number operations, in children aged 5-6 years, in addition to being done by linking with the environment and children's daily activities, can also be introduced through various types of games, for example: simple card games, including card counting, game matching motives, board games numbers, including counting movements on the board, counting points on a dice, or using a dial. Each of these activities can reinforce the concept of number operations in children aged 4-6 years.

Other activities that can support the development of the ability to operate numbers in children aged 4-6 years, include through height measurement activities, mentioning telephone numbers, house numbers, shoe or sandals numbers, or age. Measuring height and weight activities provide opportunities for children to recognize the unit of weight.: kilograms (for weight) and centimetres (for height). Apart from that the child also learns to recognize word opponents such as the weight of the word opponent light, high-low, large-small, and long-short.

Learning is the process of student interaction with educators and learning resources in a learning environment. Learning media acts as a bridge between the teacher and students in

learning. It can be understood that the learning objectives are very important for learning media in this case: (1) learning objectives determine the direction to be achieved by learning media, (2) learning objectives determine the tools / learning media to be used, (3) learning objectives determine the assessment techniques of instructional media (Hamalik 1994: 25). The media used in learning consists of various types of media, namely realia media, pictorial media and manipulative media.

Manipulative media can be used to facilitate the ability of children aged 5-6 years in numbers and counting, while the types of manipulative media that can be used in this activity include the various objects that can be found by children in the surrounding environment. The involvement of the environment in learning mathematics in children aged 5-6 years is done by bringing children to real objects that exist in the surrounding environment, so that children can manipulate the various objects they see, or bring media that can be manipulated by children into the class that is adjusted to the material of the activity. One of the media that can be manipulated by children is manipulative media. Manipulative media are all things that can be seen, touched, heard, felt and manipulated. Hynes said manipulative media is a concrete model that can be touched and moved by children to improve understanding and mathematical concepts. A similar opinion was expressed by James who explained that manipulative media is a concrete model that can be touched and driven by children, which serves to help children understand various mathematical concepts (Susilawati 2008: 29). Various objects that children encounter in their daily lives can be used as manipulative media, including plastic cups, buttons, rubber bands, used cardboard boxes, bottle caps, plastic straws, clamshells, and various concrete objects that can be manipulated by children.

The benefits of using manipulative media in learning mathematics in children aged 5-6 years according to James, include: 1) Introducing mathematical symbols through real situations. 2) Teaching problem solving skills. 3) Clarifying and facilitating both children and teachers when introducing the concept of mathematics. 4) Avoiding verbalism in learning mathematics. 5) Making it easier for teachers to present learning material in class. 6) Teaching various ways of solving problems. 7) Symbolizing mathematical problems in different ways. 8) Teaching will more attracting the attention of children, fostering their motivation to learn. 9) Activating the response of students. 10) Providing learning stimulus. 11) The learning process has a high value. (Susilawati, 2008: 38).

The action research was carried out in Kindergarten 1 Kindergarten in Panggarangan. The subject of the study was the group of children aged 5-6 years, namely Kindergarten students group B (TK B), with a total of 13 students. Kindergarten Prosperous 1 is located in the village of Panggarangan, Panggarangan District, Lebak Regency, Banten Province. The time of the study was conducted from April to May in 2019.

The research method used is Classroom action research or action research where researchers work in collaboration with classroom teachers. The action model used is based on Kemmis and Mc Taggart and includes the following steps: a) planning (planning), b) action (acting), c) observation (observing) and reflection (reflecting) (Arikunto. 2006: 106).

The research procedures carried out in this study include the following stages: 1) The pre-research stage includes field observations, the identification of problems, and the compilation of a first cycle plan and data collection planning. Success criteria for action in this study are based on the opinion of E Mills who said the study was successful if it had reached at least 71%. After being given as much action intervention in a cycle, the data obtained in the analysis is descriptive qualitative.

## Discussion

**Table 1:** Early Mathematical Ability Improvement Children aged 5-6-year, Aspect of Number Operations

No	Name Respondents	Pre-Interference		Cycle I		Cycle II		Ket
		Score	%	Score	%	Score	%	
1	AQL	12	33.3	24	66.7	30	83	BSH
2	DFA	13	36.1	24	66.7	32	88.8	BSH
3	EGR	25	69.4	31	86.1	35	97.2	BSH
4	KLA	23	63.9	27	75	33	91.7	BSH
5	NVA	26	72.2	32	88.9	36	100	BSH
6	RVA	12	33.3	26	72.2	32	88.9	BSH
7	RFL	11	30.6	25	69.4	29	80.6	BSH
8	RFI	10	27.8	23	63.8	26	72.2	BSH
9	SLM	25	69.5	31	86.1	35	97.2	BSH
10	WLN	15	41.7	30	83.3	34	94.4	BSH
11	WLD	15	41.7	29	80.5	33	91.7	BSH
12	YSM	11	30.6	27	75	31	86.1	BSH
13	ZHR	15	41.6	31	86.1	33	91.7	BSH
	$\Sigma$	213	591.7	360	999,8	419	1,163,5	BSH
	Average	16.4	45.5	27.7	76.9	32.2	89.5	

Based on the table above, it can be seen that the initial mathematical abilities of children have increased after being given the interventions of cycle I and II. Before the given intervention measures, the child beginning math skills was 45.5 %. After the intervention cycle I, the given ability of children increased to 76.9%. To test the constancy of the child's ability, the second cycle increased the ability of children to 89.5%. As agreed between researchers and collaborators, if children have experienced an average increase of 71% of pre-intervention then the research is said to be successful. Referring to the increase in beginning math skills in children, it appears that media plays an important role in the learning activities of young. This



is in accordance with the opinion expressed by Hines, who suggested that manipulative media plays an important role in improving the understanding of mathematical concepts.

## **Conclusion**

The results of the research indicate that there is an increase in quantitative mathematical skills, and in aspects of number operations, which occur as a result of the use of manipulative media. Quantitative data on the increase in mathematical abilities at the beginning of the aspect of number operations using the average percentage increase ability in number operations in children aged 5-6 years in Kindergarten I Prosperity Panggarangan. The increased ability achieved by children is in accordance with the criteria for success according to E. Mills, which requires an increase in ability above 71%. The capacity building from pre-intervention to the second cycle reached an average of above 71%. Based on these standards, all children have achieved capacity building above the established standard.

The quantitative results of the increase in initial mathematical abilities in the aspect of number operations is strengthened by the description of qualitative data, which found the influence of manipulative media on the ability to operate numbers in children aged 5-6 years. The effect of forming a patterned relationship and forming theoretical concepts, such as the influence of manipulative media on children's interest in learning increases, children's ease in mastering mathematical concepts being taught, made children more active in constructing existing media. The pattern of events exhibited by children indicates that the use of manipulative media has a significant impact on the development of early childhood learning, where children learn by constructing the environment based on something that is real or concrete.



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