

Use of Educative Teaching Aids in Improving Logical-Mathematical Intelligence for Early Childhood

Luki Luqmanul Hakim¹ and Revita Yanuarsari²

¹Mathematics Education Department, Universitas Islam Nusantara, Bandung 40286, Indonesia.

²Early Childhood Education Department, Universitas Islam Nusantara, Bandung 40286, Indonesia.

¹Email: luqmanhakim@uninus.ac.id

²Email: ryanuarsari@yahoo.co.id

Abstract. Logical-mathematical intelligence is one of the eight types of potential intelligence possessed by Early Childhood. Based on grouping, there are some mathematical concepts that should be taught to the Early Childhood. For preschool groups (0-3 years), it is necessary to recognize mathematical concepts. As for the group of children who have been able to follow the Early Childhood Education (3-6 years) carried out the development of mathematical concepts. In the development of the concept is required a learning approach that can improve logical-mathematical intelligence, such as with the use of educative teaching aids in the learning. The findings from this study reveal that: (1) the use of more educative teaching aids in Early Childhood learning can further enable students in learning, so that learning activity become more meaningful; and (2) the use of educative teaching aids can awaken the reflection ability of Early Childhood on the concepts and relationships under study. Based on these finding, it is concluded that logical-mathematical intelligence on Early Childhood is the reflection ability of a concrete experience that is not defined by its physical form or its characteristics in the real world but through how much it relates to other mathematical ideas or situations.

1. Introduction

For some teachers, accompanying children while playing or learning light work, especially when having to relate it to the purpose and benefits of each child's play activities. Likewise, by developing mathematical ability in children. Children are often asked to memorize numbers, quantity, geometric shapes, symbols and math languages, without the need to understand the principles. If so, then it must be the children have difficulty when entering elementary school.

Children have started to develop mathematical concepts from various daily activities. For example, when a baby, the child knows that he is small while his mother and father are big, even though the child has not been able to express it in spoken language. When toddlers (less than three years old), the child knows that if he accumulates a block on another beam the beam will multiply (being two) even though he cannot express it in spoken language. The child also knows that he has two beams and his friend has ten beams, so his friends more blocks so the child wants to take it from his friend. In addition, children often select their own educative teaching aids even though he does not know the basic election. Children also know the schedule of activities in a day if it is done regularly. These concepts can evolve over time into the child's basic capabilities.

One of efforts that can be done to develop the ability and potential of students is through learning mathematics. Mathematics is a science with a field of study that includes abstract concepts, symbols and patterns. Through mathematics learning, students can train the ability that is owned

continuously so that the longer it will grow. Based on the purpose of mathematics learning which is mandated by the curriculum, there are several capabilities those are expected to be possessed by students, including the ability to understand the concept of mathematics, the ability to process and explain the interrelationship between concepts and applying them, reasoning ability, problem solving, and communicate information mathematically. With these skills, students are expected to master or understand the concepts of mathematics well.

The ability to analyze the information used to solve problems relates to several other capabilities, including identifying information, explaining the interrelationships between patterns and manipulating objects. Students should be able to find the interrelation of existing information on the problem so that the picture of problem solving can be known. These capabilities can be performed well by people who have logical-mathematical intelligence. This is in accordance with Gunawan's opinion [1], that people who have well-developed logical-mathematical intelligence have the characteristic of "being able to observe and recognize patterns and relationships". Thus, problem solving has a close relationship with logical-mathematical intelligence.

Lwin, et al. [2] explains that, logical-mathematical intelligence is "the ability to handle numbers and calculations, patterns, and logical and scientific thinking". A person with logical-mathematical intelligence will be able to classify information, compare information and strategies to solve problems appropriately, process numbers and use inductive or deductive thinking in solving problems. This is in accordance with the opinion of Willis & Johnson [3] which reveals that logical-mathematical intelligence has 5 main components, namely classification, comparing, mathematical operations, inductive and deductive reasoning, and forming hypotheses and rechecking hypotheses that have been made. Yaumi [4] states that someone who can solve problems easily then that person has logical-mathematical intelligence. Thus, logical-mathematical intelligence can be used by students in solving mathematical problems so that the goal of learning mathematics can be achieved optimally.

Based on the discussion above, it is needed a learning approach that can improve logical-mathematical intelligence especially for Early Childhood, one of them is learning approach that use educative teaching aids and learning theme. According to Comenius [5] the use of more educative teaching aids enables students more active in learning. In addition, the use of educative teaching aids beside improving students' understanding and problem-solving skills, also improve students' positive attitudes toward mathematics [6]. A meaningful learning activity as well as cognitive tools can actively increase student involvement in the learning process and generate reflection on the concepts and relationships being studied. In the context of mathematics, a concrete experience is not defined by its physical form or its characteristics in the real world but by how much its relevance to other mathematical ideas or situations. For example, when a child begins to learn about numbers he is basically learning a process of counting. A ball, two balls, three balls and so on. Then "the circumstances" are represented in the symbols of numbers 1, 2, 3 and so on. Obviously the numbers 1, 2, 3 and so on are not the main objects studied in numbers. The main concept is the invisible relation between a magnitude and the unit used to measure that magnitude [7].

1.1 Logical-Mathematical Intelligence

Mathematics learning for Early Childhood is very useful for the development of logic-mathematical intelligence in children. According to Gardner [8], reveals that the logical-mathematical intelligence is one of eight types of potential intelligence possessed by children. Early Childhood can be grouped into two groups. The first group is the preschool group (0-3 years). The second group is a group of children who have been able to follow the Early Childhood Education (3-6 years).

According to Lestari [9], based on the grouping of Early Childhood above, there are several mathematical concepts that should be taught to the Early Childhood. For groups of children aged 0-3 years need to recognize mathematical concepts. While for groups of children aged 3-6 years carried out the development of mathematical concepts to children. Here are some mathematical concepts that need to be taught to the Early Childhood

1.2 The Concept of Numbers

Numbers are the most basic thing in mathematics. Teaching the concept of numbers in Early Childhood is done through two stages. First, introduce the concept of numbers to children aged 0-3 years. Second, develop the concept of numbers in children aged 3-6 years.

To introduce the concept of numbers to children under 3 years can be done through three stages as follows.

- 1) Spelled out, i.e. mention the number by sequence.
- 2) Match each number with the object being calculated.
- 3) Compare between groups of objects one with another group of objects to know the number of objects more, less, or similar.

Children begin to develop their understanding of the concept of numbers when they are invited to use numbers in various daily activities. Once the child knows the numbers, then the child's understanding needs to be developed. The concept of numbers is developed through 3 stages.

- 1) Counting. The initial stage of counting on the child is counting through memorizing or counting. Parents can develop this ability through singing, finger games, and so on that are related to numbers.
- 2) One-to-one relationship. The point is to connect one and only one number with the corresponding object. For example, pair the number 1 with 1 chicken image.
- 3) Sums, compares, and numbers symbols. When parents ask children to pick up 3 biscuits and the child brings 3 biscuits, the child understands the concept of quantity. A child who understands the sequence of numbers, will know that if counting 3 biscuits from left to right vice versa the amount will be similar. Children who understand the concept of comparison will understand larger objects, more numerous, less, or similar.

1.3 The Concept of Pattern and Relationship

Pattern is an arrangement of objects consisting of colors, shapes, numbers, or events. Example of pattern arrangement by size that is big and small. The arrangement of patterns based on the colors are red, blue, red, blue. Arrangement of patterns based on everyday events that is after eating biscuits, I drink milk.

To develop the ability to recognize patterns and relationships, children need to be given many opportunities to recognize and manipulate objects and record similarities and differences. Some examples of activities that parents can do to develop patterns and relationships in children include inviting children to play a queue of cars to form a pattern of red, black, red, black, red, black rows.

The child's abilities in patterns and relationships will be beneficial in the acceptance of the series and relationship-function lessons. In the series, children are required to develop a sequence pattern. Whereas in relation-function, children are required to develop relationship.

1.4 The Concept of Geometry and Space

The concept of geometry and space relationships here is the child recognizes geometric shapes such as triangles, rectangles, squares, the same circle, and his position in a space. Children can understand about the sense of space when the child is aware of his position when associated with the arrangement of objects around him. Children learn about places and positions, such as: above, below, on, inside, outside. In addition, children also learn about the definition of distance, such as: close, far and so forth.

Introduce the relationship of geometry and space to children can be done by inviting children to play while observing various objects around him. Children will learn that one thing has the same shape as another. Parents who have 1-3 years old can provide soft blocks or cardboard boxes of various size for children to explore and build. First the children learn to recognize simple forms such as triangles, circles, rectangles. Second, children learn about the characteristics of each geometry. Furthermore, the child learns to apply his knowledge to be creative to build with geometric shapes.

1.5 The Concept of Selecting and Grouping

Selecting and grouping includes the ability to observe and record similarities and differences in objects. Children under three years know the similarities and differences through their five senses when exploring with objects around them. The child learns by watching, hearing, touching, feeling, smelling the objects he or she is playing, to know the same and different things.

According Lestari [9] some examples of activities that parents can do to develop the ability to select and grouping in children.

- 1) In infants 8-12 months: Provide 2 kinds of fruit each type 3, e.g.: apples and oranges in a container. Encourage the child to select the fruit and put it outside the container.
- 2) In children 12-24 months: Provide 5 pieces of red blocks. Encourage the child to line up the blocks like a row of blocks based on a red pattern.
- 3) In children 24-36 months: Provide 1 basket and several plastic balls made up of 3 colors, each color 4 balls. Invite the child to include all the colored balls for example the yellow to the basket.

1.6 The Concept of Measurements

Children learn measurements from various activities that require creativity. At first step, children do not use tools, but introduce the concept: longer, shorter, lighter, faster, and slower. The next step, children are invited to use non-standard measuring instruments, such as ribbons, shoes, etc. At a higher step, children are invited to use clock, ruler, scale, and thermometer. The example of activities that can be done by parents to develop measurements to children is to invite children to measure the length and width of the toy rack using a strap or ribbon.

2. Method

The research method is quasi experiment, by using one group pretest-posttest design. Sample in this research are 27 children of Early Childhood which selected by purposive sampling. Instrument used in this research is non-test instrument in the form of observation sheet. The observation sheet was used to find out about the effectiveness of educative teaching aids in improving logical-mathematical intelligence for Early Childhood.

At first the child chooses educative teaching aids without specification. Furthermore, children select educative teaching aids s with specific, for example by color, size, or shape. At a higher stage the child can select educative teaching aids based on more than one variable, e.g. by color and shape, or color, shape and size.

Crating graphic is a way for children to display various kinds of information or data in different forms. For example, a child makes simple graphics about the child's favorite toy. The child's knowledge of the collection is related to statistics.

The example activities that can be done by parents to develop the collection, arrangement and display of data in children include inviting children to collect a variety of leaves. Then invite children to group the shape of the leaves. After that, make a list of the number of leaves for each shape by arranging the same leaves into straight rows. Invite the child to record the number of each leaf group.

3. Result and Discussion

3.1 Result

This study begins with the planning of preparing various researchs equipment's. The things that are prepared are daily activity plan, problematic picture, educative teaching aids, and research instrument. The indicators of logical-mathematical intelligence observed in this study, is presented in table 1 below.

Table 1. The Indicators of Logical-Mathematical Intelligence

Variable	Indicators	Item
Logical-Mathematical Intelligence: based on Multiple Intelligences and Ministerial Regulation No. 58 of 2009 on Early Childhood Education Standards	1. Ability to use numbers	1
	2. Think and behave regularly in a logical order	2,3
	3. Classify objects by shape and color	4
	4. Matching numbers with symbols and their colors	5
	5. Connecting the size and shape of objects around them	6
	6. Find out the working procedure of a thing	7
	7. Interest in an activity	8

Preliminary observation results (pretest) of logical-mathematical intelligence in 27 Early Childhoods is presented in table 2 below

Table 2. Preliminary Observational Data

Category	The Indicators of Logical-Mathematical Intelligence						
	I-1	I-2	I-3	I-4	I-5	I-6	I-7
capable	11	9	12	10	7	4	10
incapable	16	18	15	17	20	23	17

While the final observation results (posttest) of logical-mathematical intelligence in 27 Early Childhoods are presented in table 3 below.

Table 3. Final Observational Data

Category	The Indicators of Logical-Mathematical Intelligence						
	I-1	I-2	I-3	I-4	I-5	I-6	I-7
capable	18	23	21	21	19	15	24
incapable	9	4	6	6	8	12	3

Based on the data in table 1, it was found that at the time of initial observation of 27 children almost partially incapable of: (1) mentioning, writing, and counting numbers by rotting easily and quickly; (2) sort the numbers from the smallest to the largest vice versa, and sort the size of the object from the smallest to the greatest vice versa; (3) classify objects by shape and color; (4) matching numbers with symbols with their colors; (5) connecting the size and shape of objects around; (6) find out the working procedure of a thing; and (7) have an interest in an activity. After being treated with a learning approach using a variety of teaching aids and learning themes, based on the final observational data in table 2, it was found that from 27 children mostly could reach all indicators, except the 6th indicator is still many children who have not been able find out the working procedure of a thing.

3.2 Discussion

Beginning with this study, we think that when a child is assigned a task the children will use one of their Multiple Intelligences. After this study continued and based on observations made at the beginning and at the end of the action, as well as teacher observation notes, provided some sufficient

information and data to help us gain knowledge of how children learn, and to choose educative teaching aids and themes to be selected in the learning progress. And we recognize that children can use different intelligences or multiple intelligences that are combined to approach the problem-solving situation provided by the teacher. As the problem-solving situation changes, the mindset of children and what it is used intelligence of children can change.

This shows that Early Childhood logical-mathematical intelligence is an internal behavior in which intrapersonal intelligence is built through relationships in various contexts. They are flexible and integrative in learning, and are still exploring various media and manipulating the materials around them. Therefore, we conclude that Early Childhood has a tendency towards certain ways of learning, as well as keeping their thinking. So that teachers or educators can develop curriculum and learning activities that enable Early Childhood to use their tendency to learn to achieve their goals.

4. Conclusion

The findings from this study reveal that: (1) the use of more educative teaching aids in Early Childhood learning can further enable students in learning, so that learning activity become more meaningful; and (2) the use of educative teaching aids can awaken the reflection ability of Early Childhood on the concepts and relationships under study. Based on these finding, it is concluded that logical-mathematical intelligence on Early Childhood is the reflection ability of a concrete experience that is not defined by its physical form or its characteristics in the real world but through how much it relates to other mathematical ideas or situations.

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