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Improving Logical And Mathematical Intelligence Through Numeracy Activities In Early Childhood At Aisyiyah Bustanul Athfal 1 Kindergarten

Vivi Nur Afifah Novia Anggraini[1]✉, Nur Indah Sari[2], Anita Oktaviana[3]
Sekolah Tinggi Agama Islam Darussalam Lampung, Indonesia(1)
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✉ Corresponding author:
[vivieanggraini46@gmail.com]

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Abstrak

Kecerdasan logis matematis pada anak usia dini melibatkan pemahaman angka, pola, dan hubungan dalam pemecahan masalah. Kecerdasan ini penting bagi perkembangan anak dan diatur dalam Permendikbud No.137 Tahun 2014. Tujuan penelitian ini adalah untuk merealisasikan kegiatan numerasi dapat meningkatkan kecerdasan logis matematis pada anak usia 5-6 tahun di TK Aisyiyah Bustanul Athfal. Dalam mengumpulakan data peneliti menggunakan metode Observasi, wawancara, dan Dokumentasi. Penelitian di TK Aisyiyah Bustanul Athfal 1 Braja Harjosari menunjukkan bahwa beberapa anak masih mengalami kesulitan dalam membilang, menulis angka, atau mengalami huruf terbalik. Strategi pembelajaran yang lebih menarik dan interaktif diperlukan untuk meningkatkan kemampuan numerasi anak. Hasil dari penelitaian ini dapat dilihat pada kegiatan prasiklus anak yang Berkembang Sangat Baik hanya 20%, pada saat Siklus I anak yang Berkembang sangat Baik meningkat menjadi 33,33%, dan pada Siklus II anak yang Berkembang Sangat Baik meningkat menjadi 80% sesuai dengan target peneliti.

Keywords:
logical mathematical intelligence, early childhood, numeracy

Abstract

Logical mathematical intelligence in early childhood involves understanding numbers, patterns, and relationships in problem solving. This intelligence is important for child development and is regulated in Permendikbud No.137 of 2014. The purpose of this study was to realize that numeracy activities can improve logical mathematical intelligence in children aged 5-6 years at Aisyiyah Bustanul Athfal Kindergarten. In collecting data, researchers used the Observation, interview, and Documentation methods. Research at Aisyiyah Bustanul Athfal 1 Braja Harjosari Kindergarten showed that some children still had difficulty in counting, writing numbers, or experiencing reversed letters. Therefore, a more interesting and interactive learning strategy is needed to improve children's numeracy skills. The results of this study were that during the pre-cycle, children who developed Very Well were only 20%, during Cycle I, children who developed Very Well increased to 33.33%, and in Cycle II, children who developed Very Well increased to 80% according to the researcher's target.

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1. INTRODUCTION

Early childhood is an individual aged 0–8 years, a very important period for their growth and development, both physically and mentally. The learning process for children must take into account their unique characteristics, including different talents and interests.(Etivali, n.d.) At this stage, intelligence develops rapidly, with 50% of intelligence formed at the age of four and 80% at the age of eight. Therefore, early childhood education greatly determines the quality of the next generation.

Logical mathematical intelligence is the ability to understand situations using logic and numbers, as explained by Howard Gardner's theory of multiple intelligences (Ramadhani 2018). Children with this intelligence tend to understand the concept of numbers, patterns, time, and have the ability to think logically and solve problems. Early stimulation, social interaction, and education from an early age can help improve numeracy intelligence. Children who have well-developed logical mathematical intelligence will find it easier to understand numbers and mathematical concepts in a fun way.

Numeracy is the ability to understand and use numbers and mathematical concepts in everyday life. This includes skills in reading data, graphs, tables, and applying mathematical concepts in decision making (Goos et al. 2020). Numeracy activities have great benefits, such as improving logical thinking skills, solving problems, building self-confidence, and supporting formal learning readiness (Kholida, Sutama, and Suryadi 2020). In early childhood education, numeracy is introduced through fun activities so that children can more easily understand basic mathematical concepts.

Previous studies have been conducted on improving logical mathematical intelligence, including Lestariningrum's research informing the logical mathematical intelligence of early childhood aged 6-8 years using traditional games, by playing can improve the abilities and all aspects possessed by children (Ramadhani 2018), and develop children's logical mathematical intelligence through congklak games, because it involves mathematical concepts. The Role of Digital Parenting in the Development of Logical Thinking in Children Aged 5-6 Years, can be interpreted as the child's ability to draw conclusions that can be proven using logic and rules (Maisari and Purnama 2019), on the other hand Shoimatul Ula demonstrates logical mathematical intelligence including counting and logical thinking skills as well as problem solving skills.

The approach taken in this study is increasing logical mathematical intelligence. Ritha Ramadhani's research informs logical mathematical intelligence is the ability to understand a condition or situation using mathematical calculations and logical reasoning (Ramadhani 2018).Logical intelligence is one of the various types of multiple intelligences popularized by Howard Gardner. Logical intelligence is intelligence that has the ability to relate to a series of reasons, recognize patterns, and rules. From several previous studies, researchers have not found an increase in logical mathematical intelligence through numeracy activities.

Early numeracy is often interpreted narrowly as something involving numbers and calculations (Goos et al. 2020). In addition to what is written in (Sudirman, n.d.), in building a strong numeracy learning environment, consider how children can build new thoughts, have time to think independently, discuss with peers, reflect on successes and challenges. As written in (Rohim 2021) cognitive abilities include understanding, application and reasoning. The context of numeracy includes personal, socio-cultural and scientific contexts. It also increases opportunities in the future world of work and builds a secure mathematical foundation, which can be built through lifelong learning (Gal et al. 2020). Thus, the ability to numerate is an important fundamental life skill that permeates all aspects of our lives, such as 1) the ability to solve problems, 2) development of logical thinking skills, 3) Increased Self-Confidence, 4) Preparation for Formal Learning, 5) Building a Strong Learning Environment. In this study, the improvement of logical mathematical intelligence through numeracy activities will be measured through indicators, namely: 1) understanding patterns and relationships, 2) being able to distinguish colors, shapes, and sizes, 3) writing and counting numbers. The creation of these indicators is based on theories and problems in the field.

Logical mathematical intelligence in early childhood involves understanding numbers, concepts, shapes, and patterns in solving problems logically. Based on the theory (Ibda 2015), children aged 5-6 years are in the preoperational stage, where they think symbolically but have not used cognitive operations fully. Thus, increasing logical mathematical intelligence through numeracy activities provides a beneficial opportunity for children.

Based on the initial observations made by the researcher, the researcher saw that in the learning process the children were still busy with themselves and tended not to focus so that many children had not completed the activities completely, because the children did not like the activities carried out or tended to be bored with the atmosphere or activities provided by the teacher, this affects the children's logical mathematical intelligence. The purpose of this study was to determine whether numeracy activities can improve logical mathematical intelligence and to determine numeracy activities in children aged 5-6 years at Aisyiyah Bustanul Athfal Kindergarten. The logical mathematical intelligence of early childhood can be raised not only by learning but can be done by playing like games. This study also contributes to PAUD teachers so that they can choose numeracy activity games in improving children's logical mathematical intelligence and provide new insights into numeracy activities can be used as an effective tool in improving children's logical mathematical intelligence.

2. METHODS

The classroom action research (CAR) technique was used to conduct this research. The research was conducted to help solve classroom problems and improve teaching through in-class research. Each cycle consists of four stages, namely 1) planning, 2) implementation, 3) observation, and 4) reflection. Classroom action research (CAR) was conducted to improve logical-mathematical intelligence through numeracy activities. The subjects of this study consisted of 15 children, consisting of 8 girls and 7 boys. The researcher conducted this study in collaboration with teachers in class B to improve logical mathematical intelligence. The researcher used data collection techniques such as observation, interviews, and documentation. To measure logical mathematical intelligence, this study used observation sheets and assessments of children's achievements. The following is the observation sheet instrument for improving abilities, as shown in Table 1.

Table 1. The observation sheet instrument for improving abilities

Indicator	Star	Criteria
Understand patterns and relationships		
Can distinguish colors, shapes, and sizes		
Writing and counting numbers		

Using percentage calculations, observation data on children's behavior during teaching and learning activities were analyzed as follows:

$$P = \frac{\text{Child Development}}{\text{Number Of Childern}} \text{ X } 100\%$$

P = Percentage of Indicator Improvement (Suprapti 2022)

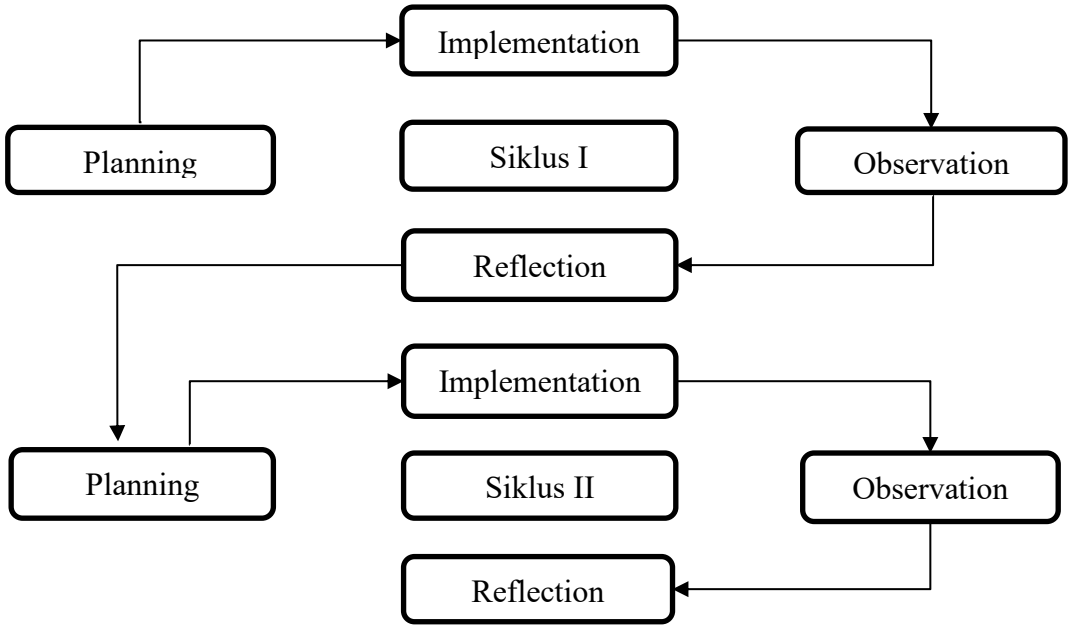

Figure 1. Stages in the Classroom Action Research Cycle (Arikunto, 2010)

To measure the success of implementing this action, researchers use predetermined indicators, such as increases in logical-mathematical intelligence. The determination of the success or failure of this action is made by the researcher through the subjects to be studied (Anisa and Sit 2024). Table 2 is an indicator of the success achieved.

Table 2. Indicator of the Success Achieved.

Presentation	Information
80%-100%	BSB
51%-79%	BSH
0%- 50%	MB

3. RESULT AND DISCUSSION

This study used two cycles; the first cycle was carried out for 2 days. The activities carried out on the first day of the first cycle included 2. The 1st activity is sorting land vehicles from the smallest to the largest, and the 2nd activity is distinguishing colors and counting vehicles. This activity aims to improve children's cognitive thinking to remember, solve problems, connect ideas, and recognize sizes, and to enhance children's logical mathematical intelligence. The 2nd day of activities was spent writing and distinguishing the names of vehicles and drawing vehicle tracks.

The 2nd cycle of activities carried out was on day 1, making bicycles from straws and origami paper, and on the second day, making airplanes from ice cream sticks. By changing the sitting position to groups in this way, children are encouraged to share, take turns using tools, be empathetic, and work together. After carrying out the activities, the researcher observed an increase in logical mathematical intelligence through numeracy activities, and the predetermined achievement indicators developed, children understood patterns and relationships, could distinguish colors, shapes, and sizes, write and count numbers.

Results of the pre-cycle implementation

Before conducting classroom action research, the researcher conducted a pre-cycle research using observation techniques on the improvement of logical mathematical intelligence through numeracy activities of children aged 5-6 years. The results of the initial assessment showed that children's logical-mathematical intelligence fell into the categories of Starting to Develop (MB) 40%, BSH (Developing According to Expectations) 40%, and BSB (Developing Very Well) 20%. The following is a recapitulation of children's pre-cycle learning activities in Table 2.

Table 2. Recapitulation of Children's Pre-Cycle Learning Activities

No	Information	Precycle	
		Amount	%
1	Developing very well (MB)	3	20
2	Developing according to expectations (BSH)	5	33,33
3	Started to develop (MB)	7	46,67

Observations at Aisyiyah Bustanul Athfal 1 Braja Harjosari Kindergarten showed that the development of children's logical-mathematical intelligence still varied, with 7 (46.67%) children in the "Starting to Develop" (MB) category, 5 (33.33%) "Developing as Expected" (BSH), and 3 (20%) "Developing Very Well" (BSB). Children still had difficulty in counting, writing numbers, and distinguishing colors, shapes, and sizes correctly. This indicates that logical-mathematical intelligence in Aisyiyah Bustanul Athfal Kindergarten, 5-6 years old, is still starting to develop.

Results of Cycle I and Cycle II.

The results of the first cycle of research showed an increase in the logical-mathematical intelligence of children who were Developing According to Expectations by 5 children (33.33%). The results of the second cycle showed an increase of 12 children (80%). The results of the children's observations showed an increase, as seen in cycles I and II. The recapitulation is shown in Table 3.

Table 3. Recapitulation Results of Cycle I And Cycle II

No	Information	Cycle I		Cycle II	
		Amount	%	Amount	%
1	Developing very well (MB)	5	33,33	12	80
2	Developing according to expectations (BSH)	7	46,67	3	20
3	Started to develop (MB)	3	20	-	-

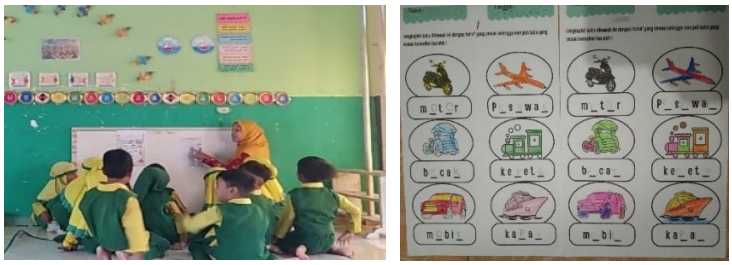

Figure 2. Activities in cycle I

Figure 2. Activities in cycle II

In the initial evaluation data, or pre-cycle, the increase in children's logical-mathematical intelligence was 20%. This shows that children's logical-mathematical intelligence remains limited. In the observation cycle I, the increase in children's logical mathematical intelligence was 33.33%, and in cycle II, it reached 80%. Children showed a rise in logical-mathematical intelligence, understood patterns and relationships correctly, could distinguish colors, shapes, and sizes, and wrote and counted well. Research shows that numeracy activities can improve logical mathematical intelligence. With each cycle, the child's growth becomes gradual.

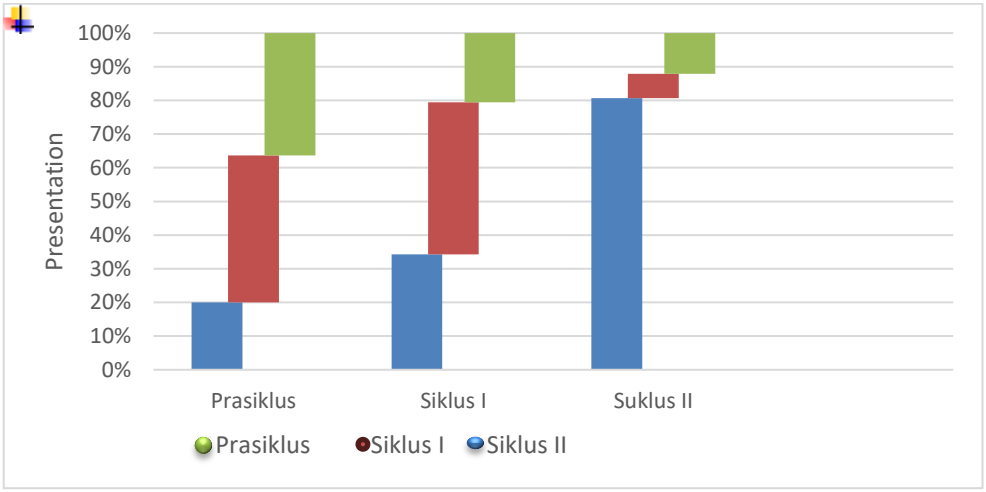

Figure 2. Graph of Comparison Between Cycles

Based on the diagram above, the green (Pre-cycle), red (Cycle I), and blue (Cycle II) images show that, overall, the research has achieved an increase in the logical-mathematical intelligence of children aged 5-6 years. Based on research, logical-mathematical intelligence is not strong, so stimulation is needed to improve children's logical-mathematical intelligence. From observations made before the pre-cycle action activities, it can be seen that many children still do not understand logical intelligence, and some do not want to do it. Therefore, the researcher chose to increase logical mathematical intelligence through numeracy activities. Interesting media must accompany numeracy learning for early childhood, so that the material and mathematical concepts taught are adjusted to the child's abilities and thinking stages (Maghfirah et al. 2022). The results of cycle I, children's logical mathematical intelligence increased, but had not reached the success indicator; therefore, cycle II was carried out.

In cycle II, children's logical-mathematical intelligence increased, meeting the indicator of success. Numeracy games can increase children's logical mathematical intelligence, because children's world is one of play while learning. Because children are in the concrete thinking stage, they easily absorb learning experiences through real objects. Learning with all five senses to understand something in a short time, so that an unconducive environment can inhibit children's desire to explore, and will affect their development (Dilla At et al. 2024). Research shows that numeracy activities can increase logical mathematical intelligence, researchers (Kholida, Sutama, and Suryadi 2020) say that numeracy skills are important basic life skills that permeate all aspects of life.

Research conducted by (Darmawanti and Sanusi 2024) also said, With innovative numeracy learning will stimulate aspects of children's development as a whole, not just number skills. Researcher Indriati also supports this research with the title "Instrument of mathematical logical intelligence test", which was developed with numeracy activities by following the method (Ulya, n.d., 2017). In addition to increasing mathematical logical intelligence, the research listed "Education, technology, Copy of the independent learning curriculum decision" explains, In building a strong numeracy learning environment, consider how children can build new thoughts, have time to think independently, discuss with peers, reflect on successes and challenges (Sudirman, n.d.). Numeracy itself is an important skill in everyday life, including understanding numbers, arithmetic operations, measurement, and analysis of quantitative information. Therefore, more interactive and fun learning strategies are needed to help children

develop numeracy skills more effectively. The following is documentation of numeracy activities in improving the mathematical and logical intelligence of children aged 5-6 years.

4. CONCLUSION

Numeracy activities are one way to improve the logical mathematical intelligence of children aged 5-6 years, because the materials used are around us, there is no need to buy, and children are interested in what they see. This study shows that increasing logical-mathematical intelligence through numeracy activities can improve children's logical-mathematical intelligence at Aisyiyah Bustanul Atfal Braja Harjosari Kindergarten. By using numeracy activities, children become happy, interested in activities, able to help friends who have difficulties, patient while waiting for turns, and complete activities. The increase in logical mathematical intelligence can be due to the percentage of children who develop very well, from 20% in the pre-cycle. During cycle I, 33.33% showed an increase, and in cycle II, 80% of children developed very well in logical mathematical intelligence.

5. ACKNOWLEDGMENTS

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