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Improving The Visual-Spatial Intelligence of Kindergarten Children Through Puzzle

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Abstract: This study aims to enhance spatial-visual intelligence using *puzzle* games to group A students of Aisyiyah Kindergarten Pabelan Kartasura Sukoharjo in 2016/2017. This study uses Classroom Action Research (CAR) in two stages: cycle I and cycle II. The subjects of this study are 13 students. The data collection uses naturalistic observation and documentation. The student's data analysis is comparative and one-way ANOVA analysis. The teacher data analysis is interactive. The percentage of the pre-cycle reaches 48%. After cyclical action I, the result gets 65.2% and reaches 87.7% in cyclical action II. The product of *one-way ANOVA* is F-count 36,051 and F-table 5.18 using the confidence level of 99%. Thus, F-count > F-table, which means Ha is accepted. Therefore, it can be concluded that the *puzzle* game can enhance the spatial visual intelligence of group A students of Aisyiyah Kindergarten Pabelan Kartasura Sukoharjo in the academic year of 2016/2017.

Keywords: *Puzzle* game, Spacial Visual Intelligence

Introduction

Early Childhood Education (PAUD), according to the Regulation of the Minister of Education and Culture of the Republic of Indonesia no. 137 of 2014, is an effort.

They are coaching aimed at children from birth (0-6 years) to facilitate a period of development and growth that is very decisive for children in their future.

The implementation of PAUD informal education is one of them, namely Kindergarten (Kindergarten), held before the Elementary School level. Kindergarten is a form of PAUD unit that organizes programs for children aged 4 to 6 years in a more structured manner. Learning in Kindergarten applies a learning approach to learning through play. Kindergarten aims to lay the foundation for the development of attitudes, knowledge, skills, creativity (creativity), and *multiple intelligences* needed by students in adapting to the environment.

One of the multiple intelligences is visual-spatial intelligence. Visual-spatial intelligence is one of the essential aspects of development in children. In addition, visual-spatial intelligence is needed in everyday life, for example, returning toys to their original place, arranging shoes on the shoe rack, organizing clothes in the wardrobe, making toys from folding paper, making toys from plasticine or *playdough*, and drawing toys objects, coloring pictures, and sewing.

The problem is that not all kindergartens understand the importance of visual-spatial intelligence for child development. Including the results of observations made by researchers on group A children of TK Aisyiyah Pabelan Kartasura Sukoharjo in the 2016/2017 academic year, totaling 12 children consisting of 3 boys and 9 girls. During the researcher's conducted observations, it was found that visual-spatial intelligence was still low.

This can be seen during drawing and coloring activities. Most children cannot draw a simple object and still have difficulty coloring using colored

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pencils. Meanwhile, during playing with blocks, most of the children were unable to rearrange the toys after being used on the toy rack. They just put it on the toy rack without paying attention to the shape of the block that fits the container. Children's ability to arrange shoes on the shoe rack is still lacking, so the shoe rack is not neat and piled up.

Meanwhile, the teacher does not provide stimulation to improve children's visual-spatial intelligence. Instead, teachers emphasize aspects of cognitive development, especially in reading, writing, and counting. This can be seen from learning to write letters and numbers, where teachers often provide portfolio sheets to thicken letters and numbers. In addition, the teacher also gives the task of counting and adding up the objects in the portfolio sheet. So that visual-spatial intelligence becomes less attention. In addition to emphasizing children's cognitive abilities, researchers also see that teachers develop more physical motor skills. This can be seen in the early activities before learning; children play throwing and catching balls, jumping, and moving their hands and feet.

Based on the results of the observations above, the researchers studied further the conditions that occurred in Group A of Aisyiyah Kindergarten Pambah Kartasura Sukoharjo in the 2016/2017 academic year. That children's visual-spatial intelligence is less developed optimally. Meanwhile, according to Ike (Lumbalumbi, 2010), visual-spatial intelligence can also affect children's learning process at school. One of them, helping children understand math story problems where children more easily understand the concepts of subtraction, addition, multiplication, and even division. Then according to Surastuti in Lumbalumbi's quote, 2010 states there is a close correlation between visual-spatial intelligence and mathematical logic abilities so that children look smart in solving mathematical and spatial problems, such as spatial geometry and mathematical algebra. With visual-spatial intelligence, children can solve math problems quickly.

From this statement, it is undeniable that spatial intelligence is essential to have because it will be helpful in understanding lessons even in everyday life. Childhood is the most accessible period to develop visual-spatial intelligence (Lucy, 2010: 27). According to Ulfah and Suyadi (2013: 1)

Early childhood lays the foundation or initial foundation and is also called *the golden age* for children's intelligence.

This intelligence has tremendous benefits in human life. Almost all the work produced requires visual-spatial intelligence. Musfiroh (2004: 12) designed buildings (architecture, garden design, and interior design), paintings, fashion designs, sculptures, tailors, surgeons, make-up beauticians, and pilots.

Therefore, the researchers considered that action was needed to improve the visual-spatial intelligence of children in group A Aisyiyah Kindergarten Pabelan Kartasura Sukoharjo in the 2016/2017 academic year. To hone visual-spatial intelligence in children, it can be done in various ways. One way is with a game *puzzle*. Children practice recognizing different shapes, patterns, sizes, colors, and images with games puzzle, then arranging or arranging them into a complete picture form.

Game *puzzle* Media is an exciting game because it can be made of wood or other materials, with pictures, sizes, and various pieces. In addition, games are *puzzles* also safe for children. For example, at the Aisyiyah Pabelan Kindergarten school, there are already game media *puzzle*s with various pictures.

The purpose of this study was to improve the visual-spatial intelligence of children in group A in TK Aisyiyah Pabelan Kartasura Sukoharjo for the 2016/2017 academic year. In particular, the research also aims to improve

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visual-spatial intelligence through games *Puzzle* for group A children at Aisyiyah Kindergarten in Pabelan Kartasura Sukoharjo for the 2016/1017 school year.

According to Gardner (2013: 24), intelligence can solve problems or create valuable products in an environment. There are nine types of intelligence: language-linguistic intelligence, logic-mathematical intelligence, visual-spatial intelligence, physical-kinesthetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, natural intelligence, and existential intelligence. The nine bits of intelligence need to be developed.

They are optimally following the potential abilities and talents of each child, including visual-spatial intelligence. In Purnamawati and Widianto (2014: 79), visual-spatial intelligence is the ability to see objects from various points of view and observe the visual (image) and spatial (regarding space or place) world. Visual-Spatial Intelligence has several indicators. According to Yus (2011:77) indicators of visual-spatial intelligence in children aged 4-5 years include: Arranging more than four objects in one *space*, such as arranging books in a bag, arranging tables and chairs in the classroom, arranging toys into the toy basket Filling more complicated patterns, such as rattles with specific color patterns, certain shapes, and certain sizes, sticking according to a specified color or shape pattern, Making some known shapes, such as forming meatballs from *playdough*, forming castles from sand, forming clay bowls, etc., Drawing objects according to the imagination, by drawing landscapes, painting abstracts, painting faces, and so on, Sewing more complicated shapes, such as weaving and tying with rigging, Using simple art tools, such as playing a musical instrument and coloring.

According to McKim, in the quote Campbell. et al. (2002: 109) states that visual thinking includes all human activities. A person's visual-spatial intelligence can develop well, namely by:
Learning by seeing and observing objects, faces, shapes, colors, details, and natural scenes, Directing himself to things effectively in space, such as when putting something in a hole, finding a path in the forest, driving a car on a busy road, designing clothes, and sewing clothes, Generating and feeling a mental image, thinking in pictures, and visualizing details. Using visual images to aid in remembering information Reading graphs, charts, maps, and diagrams Enjoying rare photographs or paintings, carvings, and reliefs Enjoying three-dimensional shapes. Such as houses, containers, bridges, planes, clothes, and other objects Mentally able to change the shape of an object into a new form, such as folding paper, making sculptures, and so on, Creating an actual or visual image of information and new records from visual-spatial media or original artwork, Able to design abstractly or visually representational, Expressing interest or expertise in being an artist, photographer, technician, videographer, architect, designer, art observer, pilot, or other visually-oriented careers.

Method

This research belongs to the type of classroom action research. Classroom Action Research (CAR), according to Arikunto (2016: 1) is research that explains the causes and effects of treatment, what has happened if the treatment is given, and explains the entire process from the beginning of the antidote to the impact of the treatment. Sanjaya (2011: 25-26) explains that CAR has 3 terms, namely research, action, and class. First, research is a problem-solving process that is carried out systematically, empirically, and controlled. Second, both actions are defined as specific treatments carried out by the teacher. Third, the classroom is a place for the learning process that takes place for students.

The actions carried out in this study used 2 cycle stages, namely the first cycle stage and the second cycle stage. Before doing the steps of cycles I and

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II, the researchers observed children's visual-spatial intelligence at the pre-cycle stage. The first cycle stage was conducted in 2 meetings, and the second cycle stage was carried out 2 times. Thus, the number of sessions is 4 times.
Explanation of research procedures at the stages of the cycle, namely:

1. Pre-Cycle

In the pre-cycle, the researcher made observations to determine the child's visual-spatial intelligence position and did not take any action. If in the statement it turns out that no stimulation triggers the emergence of indicators of children's visual-spatial intelligence, the researchers carry out inspiration as programmed.

2. Cycle I

In cycle one there are four stages: planning, implementing actions, observing, analyzing, and reflecting.

a) Planning

Activities Planning is the first step in conducting Classroom Action Research (CAR). This step becomes the basis for the next steps, namely implementation, observation, analysis, and reflection. Planning includes identifying, formulating problems, analyzing problems, and developing interventions. With good planning, CAR implementing teachers will find it easier to overcome difficulties and encourage teachers to act more effectively. As part of planning, teachers as researchers must collaborate (work together) and discuss with colleagues to establish criteria and common language and perceptions in designing corrective actions. The stages carried out at the planning stage include problem identification, problem analysis, problem formulation, and action formulation in the form of action hypotheses.

In the implementation of learning, action plans in the context of research are stated in daily developmental learning plans (RPPH). The researcher also prepared a game *puzzle* that would be used in the first cycle of action. The planned time to play the *Puzzle was* 30 minutes. The researcher prepared an observation sheet, namely a table of observations of children's visual-spatial intelligence values.

b) Implementation of Actions

Implementation of actions that contain an explanation of the stages of action for the cycle I. Researchers carry out three activities, namely opening activities, core activities, and closing activities. The process was conducted in 2 meetings; each research was carried out on 1 day of implementation.

At the first meeting, the RPPH was themed on the work of teachers. The opening activities are marching before entering class, doing gymnastics, reading prayers, reading short letters, the teacher doing apperception about the theme of the teacher's work. The core activity is the action given to the child in the form of a game *puzzle*. Closing activities in the form of, the teacher conducts questions and answers to the children about the activities carried out, the teacher gives *rewards*, prays together before going home.

This observation contains an explanation of the observation activities carried out directly on the children and teachers. Observations of children observe children's visual-spatial intelligence, while teachers' words are carried out by following the teacher's learning process. This reflection explains critically reviewing in terms of changes that occur during the learning process both in children, the classroom atmosphere, and the teacher as the subject of giving action. In reflection activities. The result of the reflection is a revision of the plans that have been implemented, which will be used to improve teacher performance at the next meeting. The data collected in the observation activities must be analyzed and interpreted as soon as possible so that the action can be immediately identified towards achieving the objectives.

2. Cycle II

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a) Planning The

planning of the second cycle phase depends on the analysis results and reflection of the first cycle phase. The researcher identifies, formulates problems, analyzes problems, and develops interventions. CAR implementing teachers collaborate (work together) and discuss with colleagues to build criteria and common language and perceptions in designing corrective actions.

The implementation of the action plan learning is outlined in a daily Learning Implementation Plan (RPPH). As in the first cycle, the researcher made a daily developmental learning plan (RPPH), prepared a game *puzzle* as They are needed and prepared an observation sheet, namely a table of children's visual-spatial intelligence observation scores. The stages carried out at the planning stage include problem identification, problem analysis, problem formulation, and action formulation in the form of action hypotheses.

b) Implementation of Actions

Implementation of actions contains an explanation of the stages of action for cycle II. The researcher carried out the action, which consisted of three activities: opening activities, core activities, and closing activities. The process was conducted in 2 meetings; each research was carried out on 1 day of implementation. At the first meeting, the RPPH was themed on water. The opening activities are marching before entering class, doing gymnastics, reading prayers, reading short letters, the teacher doing apperception about the theme of the teacher's work. The core activity is the action given to the child in the form of a game *puzzle*. Closing activities in the form of, the teacher conducts questions and answers to the children about the activities carried out, the teacher gives *rewards*, prays together before going home.

c) Observation

This observation contains an explanation of the observation activities carried out directly on the children and teachers. Observation of children is observing children's visual-spatial intelligence, while teachers' words are carried out by following the teacher's learning process.

d) Analysis and Reflection

This reflection explains critically reviewing the changes that occur during the learning process both for children, the classroom atmosphere, and the teacher as the subject of action in reflection activities. Reflection activities can describe the results of action planning on the process and the results of observations. It was obtained and the resulting impact of the action to determine improvements to the action plan in the next cycle. Observation is a data collection technique by direct observation of the object under study. According to Muhibbin (2007: 31), the naturalistic observation method is a kind of observation that is done naturally. In this case, the researcher is outside the object under study or does not appear to be the person conducting the research.

Result and Discussion

Based on the calculation of scores and percentages, a comparison of visual-spatial intelligence is obtained as follows:

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Table 4.1 Comparison of the Average Percentage achieved in each

Aspect	Pre-Cycle	Cycle I	Cycle II
Percentage of Intelligence achieved	48%	65.2%	87.7%
Performance Indicators Research	-	60%	80%

Based on this score, it can be concluded that game *Puzzles* can improve visual-spatial intelligence in group A children at Aisyiyah Kindergarten Pabelan Kartasura Sukoharjo 2016/2017 Academic Year. At the pre-cycle stage, the average visual-spatial intelligence of children is 48%. The average visual-spatial intelligence of children can be seen in appendix 7a. In the first cycle stage, the percentage of children's visual-spatial intelligence increased to 65.2%. Furthermore, there was an increase in the average rate of children's visual-spatial intelligence by 17.2% from 48% to 65.2%. This shows that the actions taken in the first cycle can improve children's visual-spatial intelligence.

At the stage of Cycle I, the child gets an action; namely, the researcher gives 32game media *puzzle* with media materials, some are made of wood, and some are Made of paper *duplex*, with pictures and the number of pieces as follows: Animals (duck, fish, dolphin, elephant), lions, tigers, birds), Fruits (bananas, apples, mangoes, grapes, oranges), Means of transportation (cars, trains, boats, airplanes), People doing work (teachers, farmers, fishers, traders, artisans) paint), letters of the alphabet, geometric shapes The number of puzzle pieces also varies. There are 26 pieces (1 *puzzle*), 12 bits (10 *puzzles*), 10 pieces (5 *puzzles*), 8 pieces (3 *puzzles*), 6 articles (10 *puzzles*), and 5 parts (3 unknown).

Various puzzle game media are given to children; it makes children interested and happy in playing puzzles. Increasing the percentage of children's visual-spatial intelligence is also due to the teacher's success in providing motivation and stimulation to children to want to play *puzzles*. After the first cycle of action, the results have reached the first cycle research performance indicators of 60%.

After the second cycle, the average visual-spatial intelligence of children increased by 22.5%, from 65.2% to 87.7%. This was because the action in the second cycle had been successful. Activities in cycle II have been improved based on the results of analysis and reflection in cycle I. Improvements made are, researchers add *puzzles* more varied in terms of number, pictures, and several pieces.

Researchers prepared a 55game media *puzzle*. Some media materials are made of wood, and some are made of paper *Duplex*. Images *Puzzle* vary, including: Animals (duck, fish, dolphin, elephant, lion, tiger, bird, butterfly, giraffe, turtle, horse, cow, rabbit, rhino), Fruit (banana, apple, mangoes, grapes, oranges, watermelons, pineapples), means of transportation (cars, trains, boats, airplanes, wagons, rickshaws, bicycles), people doing work (teachers, farmers, fishers, traders, painters) house building, Mosque building, Alphabet and hijaiyah letters Numbers, Geometrical forms, Sequence of prayer movements, Sequence of ablution movements The Several puzzle pieces also vary. There are 26 pieces (3 *puzzles*), 24 pieces (2 *puzzles*), 15 pieces (3 *puzzles*), 12 pieces (22 *puzzles*), 10 articles (5 mysteries), 8 bits (3 unknown), 6 pieces (12 *puzzles*), and 5 pieces (5 *puzzles*). With the variety of puzzle game media, children are more and more interested. In addition, the teacher gives *rewards* to children who have completed playing *puzzles* so that children are more enthusiastic in playing *puzzles*.

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The increase in the average percentage of children's visual-spatial intelligence from the pre-cycle stage to the second cycle indicates success in giving class actions. In addition, the achievement of the average visual-spatial intelligence percentage in cycle II is 87.7%, meaning that the target criteria for research performance indicators in cycle II are 80%.

The results of data analysis with *one-way ANOVA* to test the hypothesis. First, the f-table that is used for the level of confidence is 99% Wrong is 1% If F set. First, it is set n1 based on the *degree of freedom* (fd) *between groups* (number of *variables variables*-1) is 3-1 = 2, while n2 using (df)-1) *within groups* (number of data-number of *variables*) is 36-3 = 33. By using a 99% confidence level, the F-table is 5.18.

After the F-table has been determined, the next step compares it with the F-count results from the Anova test results. The product of the F-count is 36,051. So when compared between the F-count of 36,051 and the F-table of 5.18, it means that the F-count > F-table, then Ha is accepted. The conclusion is that games *Puzzle* can improve visual-spatial intelligence in group A children in TK Aisyiyah Pabelan Kartasura Sukoharjo in the 2016/2017 academic year. The stable *One-way Anova* can be seen in appendix 8.

Conclusion

From the overall discussion of research on improving children's visual-spatial intelligence in Group A of Aisyah Pabelan Kindergarten Sukaoharjo's 2016/2017 academic year, it can be concluded that games *Puzzle* can improve visual-spatial intelligence.

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