

APPLICATION OF CARDBOARD MAZE GAMES TO IMPROVE EARLY CHILDHOOD SPATIAL VISUAL INTELLIGENCE

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Abstract

This study aims to determine the application of cardboard maze games in improving early childhood visual-spatial intelligence. Visual-spatial intelligence is important to be developed from an early age because it is related to the child's ability to understand shapes, directions, positions, spaces, and relationships between objects. Based on the literature, these abilities need to be stimulated through concrete, interactive, and interactive play activities that involve coordination of children's vision and movements. However, the results of initial observations at KB Ar-Rahman Tembilahan show that children's visual-spatial abilities have not developed optimally. This can be seen from the percentage of teacher activity of 52%, children's activity of 46%, and the results of the child's visual-spatial intelligence test of 45.55% in the pre-cycle stage. This condition shows the need for the use of interesting learning media that is in accordance with the characteristics of early childhood learning, one of which is through cardboard maze games. This study aims to determine the application of cardboard maze games in improving the visual-spatial intelligence of early childhood. The research used a *mixed approach*, namely qualitative and quantitative, with a type of classroom action research carried out in two cycles on 10 children aged 5–6 years at KB Ar-Rahman Tembilahan. Data were collected through observation of teacher activities, observation of children's activities, and visual-spatial intelligence tests. The results of the study showed an increase in each indicator. The percentage of learning implementation by teachers increased from 52% in the pre-cycle to 82% in the first cycle and 90% in the second cycle. Children's activity increased from 46% in the pre-cycle to 74% in the first cycle and 83% in the second cycle. The results of the children's visual-spatial intelligence test increased from 45.55% in the pre-cycle to 70% in the first cycle and 80.2% in the second cycle. These findings show that cardboard maze games effectively improve children's visual-spatial intelligence through fun, concrete, and interactive learning activities. Therefore, teachers are advised to use simple game media as one of the efforts to improve early childhood cognitive abilities.

Keywords: *Cardboard Maze Games, Visual-Spatial Intelligence, Early Childhood*

INTRODUCTION

Early childhood development is a golden period that determines a child's future success. At this time, all aspects of child development such as cognitive, language, social-emotional, motor, and multiple intelligence develop rapidly if

they are given the right stimulation. One of the important intelligences to develop is visual-spatial intelligence, which is the ability to understand, process, and manipulate shapes, spaces, and relationships between objects in one's mind. This intelligence plays an important role in academic skills such as reading, writing, arithmetic, as well as life skills such as directional orientation, the ability to formulate patterns, and solve daily problems. (Jannah, 2021)

According to Gardner, visual-spatial intelligence is included in the compound intelligence that needs to be developed from an early age. Children who have good visual-spatial intelligence can usually recognize shapes, predict the position of objects, and understand maps or directions more easily. In contrast, children who are less stimulated are at risk of having difficulty understanding geometric concepts, reading charts, or even determining directions. (Gardner, 2011) Therefore, proper stimulation is necessary for this ability to develop optimally in childhood.

Games are one of the most effective mediums to stimulate various aspects of children's development. Through play, children can learn actively, creatively, and fun without feeling forced. One of the relevant forms of play to improve visual-spatial abilities is maze games. Cardboard maze games are a form of Educational Game Tools (APE) made from used cardboard materials and designed into certain paths for balls or marbles to pass. This game is a simple, cheap, and environmentally friendly learning medium because it utilizes used items that are easy to find around children. In early childhood learning, cardboard maze is very suitable because it provides a concrete learning experience through fun play activities. (Maria Ulfa, 2021). In line with Zulaiha's opinion, the cardboard maze is a form of Educational Game Tool made from simple materials, especially used cardboard, then formed into certain paths so that children can direct the ball or marble from the starting point to the destination point. This media includes games that emphasize learning activities while playing, so that it is in accordance with the principles of early childhood learning that demand concrete, interesting, and fun experiences. In addition to being cheap and easy to make, cardboard maze is also environmentally friendly because it utilizes used

goods as a functional learning medium. (Zulaiha, 2024).

Cardboard maze also has great benefits for children's cognitive development. As they play, children learn to recognize spaces, choose paths, predict the outcome of each move, and solve simple problems to achieve the goals of the game. This process is in line with logical learning and problem-solving in early childhood, as children are trained to think actively, try alternative paths, and correct mistakes independently. (Siti Maimanah et al., 2022). Mazes can train children to find paths from one point to another, honing spatial orientation, planning, and decision-making. Research shows that maze games have a positive influence on the development of early childhood visual-spatial skills. (Lestari, 2020).

The results of research by Fadillah et al. at Pancasila III Kindergarten in Surabaya show that maze games are able to significantly improve the visual-spatial intelligence of children aged 5-6 years. In the study, the use of paper-based maze games was able to increase children's visual-spatial concept mastery scores with the Mann-Whitney U test showing a p-value of 0.001, which means that there is a significant difference between before and after the intervention. (Fadillah, et al., 2022) Another study conducted at PAUD Jantong Hatee-Ma, Bireuen, also supports this finding. Through the Classroom Action Research (PTK) method, maze games are able to improve children's ability to understand the concepts of space and form, which are measured through success indicators in each cycle. (Salsabila, 2022)

However, most of the existing research still uses paper-based or digital maze media, so it lacks the motor experience that supports children's physical development. In this case, cardboard media can be a more attractive alternative, as it involves both gross and subtle motor activities at the same time. Children not only hone their thinking skills to find their way out, but also involve physical activities such as moving objects in the path of a cardboard maze. This media is real, easy to obtain, environmentally friendly, and can be created according to the desired needs and level of difficulty.

The study conducted by Fatimah at RA Ar Rafif Kalasan, Sleman, developed a cardboard maze game as an innovation in learning media. The results showed that this game was able to significantly improve children's visual-spatial intelligence, with success indicators reaching more than 90% in the second cycle. Children become more skilled at recognizing shapes, connecting trajectories, and matching pictures in the context of maze games. (Fatimah, 2021) This shows that cardboard maze games not only provide cognitive stimulation, but also increase social interaction between children when playing together.

Based on the previous explanation, the researcher concluded that the use of cardboard maze games as a learning medium can create a more interesting and interactive learning environment, thereby encouraging children's motivation and participation in learning activities. This media is considered effective as a means of stimulation because it is able to provide direct experience in practicing thinking skills, recognizing patterns, and understanding directions. These activities not only provide fun, but also contribute positively to the cognitive development of children, especially in the aspect of visual-spatial intelligence. Through the use of creative media such as cardboard mazes, it is hoped that the quality of learning in early childhood education will increase so that children are able to adapt to the advancement of science and skills to the maximum.

This can be a solution to the problem found by researchers at KB Ar-Rahman Tembilahan, showing that children's visual-spatial abilities are still at a low level. This can be seen when children are asked to order geometric shapes such as circles, triangles, and squares along with their colors based on a predetermined pattern. Most children are not able to follow the teacher's directions well, making it difficult to recognize patterns and order objects systematically. This condition indicates that the child's ability to understand the relationship between shape, size, and color has not been optimally developed. In fact, visual-spatial intelligence is one of the important cognitive aspects that plays a role in pre-mathematics skills, pattern recognition, and problem-solving skills in early childhood development.

In addition, the teacher also found that children had difficulty in determining the right and left directions when doing gymnastics activities and when given simple questions related to direction. The ability to recognize direction is part of spatial orientation skills that are important indicators of visual-spatial intelligence. This low ability can have an impact on the development of later academic skills, such as reading, writing, and arithmetic, which require an understanding of position and direction. This fact confirms the importance of appropriate stimulation to improve children's visual-spatial intelligence from an early age through activities that are interesting, contextual, and in accordance with the characteristics of child development.

Based on the problems that have been identified, a solution is needed to overcome the low visual-spatial intelligence of children, namely by applying learning media in the form of cardboard maze games. This media is designed in a simple yet creative way to stimulate children's ability to recognize shapes, directions, and patterns through fun play activities. Cardboard maze games are chosen because they are easy to make, the raw materials are affordable, and they can be adapted according to the level of difficulty required. In addition, this medium provides a real experience for children to practice spatial thinking, spatial orientation, and problem-solving skills. With the use of cardboard maze games, the learning process becomes more interesting and interactive, so that it can optimize children's cognitive development, especially in the visual-spatial aspect.

The purpose of this study is to find out how the application of cardboard maze games in improving visual and spatial intelligence in early childhood. However, this goal is not easy to realize considering that teachers still rarely use creative media such as cardboard mazes in learning activities. Therefore, the application of cardboard maze games is very important to be introduced so that teachers have new insights into media that are innovative, interesting, and relevant for children's development. This game is able to provide a concrete learning experience that can effectively hone directional orientation and pattern recognition skills. With the application of this media, it is hoped that the quality of learning and visual-spatial intelligence of children in early childhood education institutions

can increase significantly.

The research gap in this field lies in the lack of systematic studies on the use of cardboard maze media in improving children's visual-spatial intelligence. Most previous research has focused on paper-based maze games or digital applications, while the use of concrete cardboard media is still rare. In addition, few studies have examined the mechanisms of development of children's visual-spatial skills during play, as well as the relationship between the intensity of play and the results achieved. Therefore, this study is important to provide empirical evidence about cardboard maze games on early childhood visual-spatial intelligence, as well as to offer alternative creative learning media that is easy to apply at school and at home.

Based on this description, it can be concluded that visual-spatial intelligence is very important to be developed from an early age, and games are the right medium to stimulate this ability. The cardboard maze game was chosen because it combines elements of spatial thinking and motor activities in a fun atmosphere, and has the potential to provide a more meaningful learning experience than conventional media. Thus, this research is expected to contribute to the development of creative learning strategies that support early childhood cognitive development.

RESEARCH METHOD

This study uses *a mixed method*, which combines qualitative and quantitative approaches. A qualitative approach is used to describe the steps of Classroom Action Research (PTK), starting from the planning, implementation, observation, observation, to reflection stages, by utilizing observation sheets and field notes to assess the process of applying cardboard maze games in learning. Meanwhile, a quantitative approach is used to assess the improvement of a child's visual-spatial intelligence through an assessment instrument that includes the skills of recognizing shapes, directions, and patterns. This type of research is PTK which is conducted at KB Ar-Rahman Tembilahan in children aged 5–6 years. The research is designed in two cycles, each of which includes the stages of planning, implementation, observation, and reflection. The research activity is

scheduled to last for three months, starting from February 5 to May 5, 2025.

This study involved 10 early childhood subjects consisting of 5 boys and 5 girls at KB Ar-Rahman Tembilahan. The object of this research is the application of cardboard maze games as a learning medium designed to improve children's visual-spatial intelligence. Through this game, children are expected to be able to develop the skills of recognizing shapes, understanding directions, and sequencing patterns, so that their visual-spatial abilities can develop optimally.

Researchers collected data using several techniques, one of which was an observation sheet to monitor the activities of teachers and children during the process of implementing the cardboard maze game. This observation was carried out to see children's involvement in play activities, responses to teachers' instructions, and children's ability to recognize shapes, directions, and patterns through play. The statement indicators used in the observation sheet are presented in the following table:

Table 1: Indicators of observation of teachers' activities

No	Aspek Yang Di Observasi
1.	The teacher prepares cardboard maze media as a learning medium.
2.	The teacher introduces to the child about the game of cardboard maze.
3.	The teacher invites children to play together in turn using cardboard maze games.
4.	The teacher directs the game which starts from the start then goes through the winding road until it reaches the exit
5.	The teacher guides the child to re-practice the activities that have been exemplified before.

Table 2: Indicators of child activity observation

No	Aspects Observed
1	Children observe the media of the cardboard maze that has been prepared by the teacher.
2	Children listen to the teacher's explanation on how to use cardboard maze media.
3	Children play cardboard maze media according to their abilities and follow the teacher's direction.
4	Children explore using learning media that have been provided

	by the teacher.
5	The child mentioned the geometric shapes found in the cardboard maze media.
6	Children participate in discussions with teachers to reflect on the experience of playing using cardboard maze media.
7	Children answer questions asked by teachers

Table 3: Test Instruments

NO	Indicator
1	Children are able to observe and understand information presented through simple maps, pictures, or graphs.
2	Children are able to imagine and express a visual image of an object or event.
3	Anak able to produce works based on their ideas or imagination.
4	Anak menunjukkan Interest in visual media, such as movies, videos, slides, images, and photos.
5	Anak menikmati permainan that involve visual-spatial abilities, such as puzzles and mazes.
6	Children show sensitivity in recognizing and distinguishing various colors.

The analysis techniques used to analyze the observation results and test results are:

$$P = \frac{F}{N} \times 100\%$$

Remarks

P = percentage of turnover

F = frequency of acquisition results

N = total.

RESULTS AND DISCUSSION

1. Implementation of the Cardboard Maze Game Application

The implementation of cycle 1 of several planning stages, the researcher prepared RPPH according to the learning theme, prepared cardboard maze media, and observation sheets that were used to monitor children's involvement and teacher activities during the process. At the implementation stage, the teacher introduces the cardboard maze game to the child, provides examples of how to play, and assists the child so that they can order the paths on the maze according

to the instructions. Observations are carried out directly using observation sheets to assess children's visual-spatial skills, such as skills to recognize shapes, directions, and patterns. After all the meetings are completed, reflection is carried out to evaluate the results and determine improvements in the next cycle.

Cycle II uses the same steps as cycle I, namely planning, implementation, observation, and reflection. The difference in cycle II lies in the teacher's strategy in providing instruction and the difficulty level of the cardboard maze game which is made more varied in order to challenge children to think more creatively. The teacher provides guidance as necessary, while the child is encouraged to complete the labyrinth path independently. The observation process was again carried out to assess the development of children's visual-spatial intelligence compared to the results in cycle I, and the reflection results were used to conclude the effectiveness of the application of cardboard maze games.

After the first cycle is completed, the research is continued to the second cycle by applying the same learning, namely using a cardboard maze game as a learning medium. In the second cycle, the children looked more familiar with the game so that they were able to follow the teacher's directions better. Play activities become smoother because children have understood how to complete the maze path according to the instructions. To clarify the concept of the learning media in question, the following image shows the design of the cardboard maze game applied in this study.

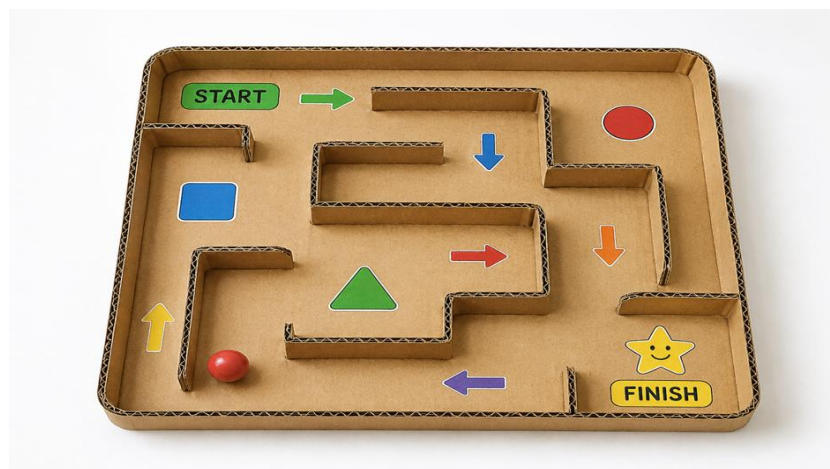


Figure 1
Cardboard Maze Game Design

2. Observation Results of Teachers in the Application of Cardboard Maze Games

The data from observations on the implementation of learning using cardboard maze games was obtained through monitoring teacher activities during the process. Observation was carried out starting from the pre-action stage, then continued in cycle I, and cycle II. The development of teacher activities and children's involvement in learning with cardboard maze media is presented briefly through the following Image.

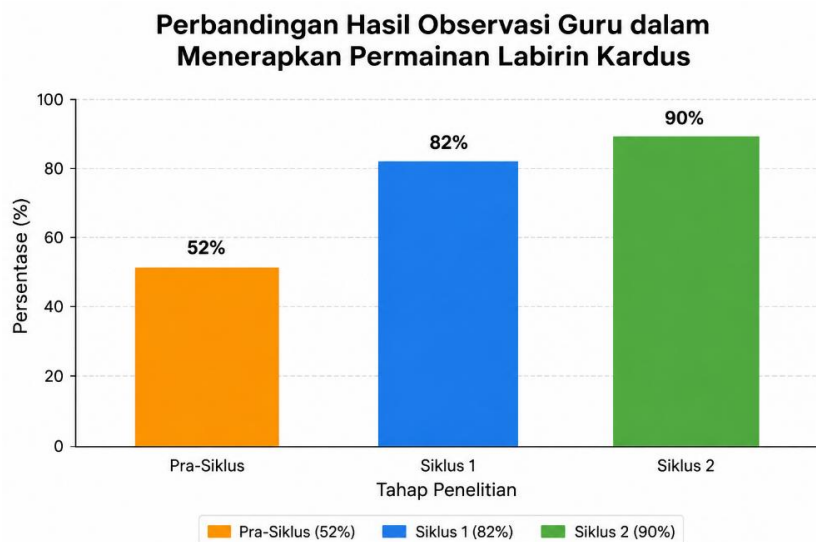


Figure 2
Comparison of Teacher's Observation Results in Applying *Cardboard Maze Games*
(pre-Cycle, Cycle 1 & Cycle 2)

The results of teachers' observations in the use of cardboard maze games to improve children's visual-spatial intelligence showed significant changes at each stage. In this study, a *mixed method approach* was applied by combining quantitative data in the form of the percentage of implementation of teacher activities and qualitative data in the form of observation results on the way teachers carry out learning, use media, and involve children in cardboard maze game activities. Both types of data are analyzed in an integrated manner to provide a more comprehensive picture of

changes in the learning process in each cycle. In the pre-cycle, the percentage of implementation only reached 7%, which indicates that teachers are still using conventional learning methods. The media used has not been able to support children's active involvement, so the learning process takes place less interesting and tends to be abstract.

In the first cycle, the percentage increased to 82%, which means there was an increase of 30%. This shows that teachers are starting to adapt to new media in the form of cardboard maze games. At this stage, teachers have tried to implement more structured and interactive learning measures, although there are still some obstacles such as lack of technical mastery of the game and suboptimal time management. Furthermore, in the second cycle the implementation percentage reached 90%, or an increase of 8% from the previous cycle. This increase indicates that teachers are more proficient in using cardboard maze games as a learning medium. Teachers are able to provide clear instructions, facilitate children to the maximum, and create an interesting learning atmosphere. Overall, these results prove that the application of cardboard maze games not only increases children's activeness, but also increases teachers' competence in designing learning.

From the description above, it can be concluded that the learning carried out at KB Ar-Rahman requires teachers to have competence in order to be able to use and develop varied media so that early childhood children are more enthusiastic and motivated in participating in learning. In line with Hurlock's opinion that play is one of the important means to help children understand concepts through direct experience, including the concepts of direction, form, and space. (Hurlock, 2015) In addition, Sudjana emphasized that the use of appropriate media in the teaching and learning process can improve the quality of learning and make abstract concepts more concrete. (Sudjana, 2017)

3. Observation Results in Children in the Application of Cardboard Maze Games

The data from observations on the implementation of learning using cardboard maze games was obtained through child monitoring during the process. Observation is carried out starting from the pre-cycle stage, then continued in cycle I, and cycle II. The development of teacher activities and children's involvement in learning with cardboard maze media is presented briefly through the following Image.

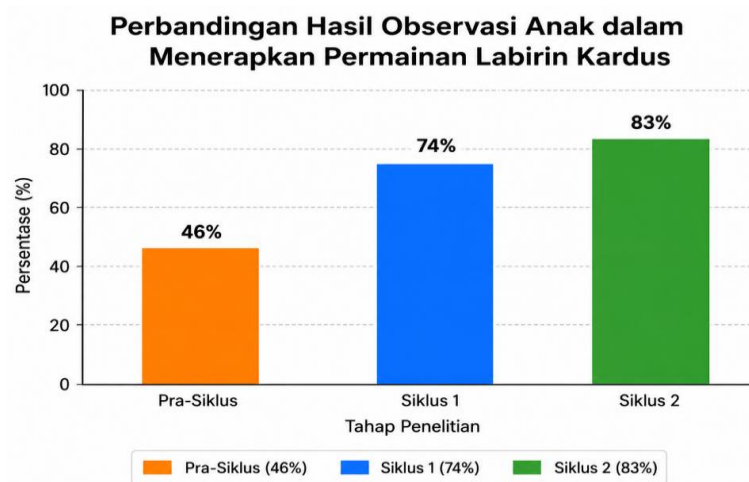


Figure 2
Comparison of Children's Observation Results
in Applying *Cardboard Maze Games* (Pre-Cycle,
Cycle 1 & Cycle 2)

The results of observation of children in the application of cardboard maze games showed an improvement in skills in each cycle. In the pre-cycle stage, the achievement percentage is only 46%, this condition shows that children still have difficulty in completing tasks related to direction and space. Previous learning activities did not involve concrete media so that learning felt abstract and less interesting for children.

In the first cycle, children's achievement increased to 74%, an increase of 28% from the pre-cycle. This increase indicates that cardboard maze games provide a new stimulus that is able to increase children's interest in learning. However, at this stage, it is still seen that some children need assistance to understand the concept of the labyrinth path thoroughly.

In cycle II, the yield increased again to 83%, with an additional increase of 9% from the previous cycle. This percentage shows that most children are familiar with the game activities and are able to complete the maze path more independently. Overall, this data proves that cardboard maze games can help develop children's visual-spatial abilities through fun and interactive activities.

The conclusion of the above description is explained that early childhood is more enthusiastic in learning by using learning media such as new game media even though it is made from simple materials such as a maze of cardboard. In line with research by Yuliani in the journal *PAUD Lectura*, it also shows that the use of concrete and interactive game media is able to significantly improve children's visual-spatial skills compared to conventional learning. Thus, the application of cardboard maze games has proven to be effective as a learning strategy to optimize children's visual-spatial intelligence through interesting activities and in accordance with their developmental characteristics. (Yuliani, 2020) Thus, simple play media such as cardboard maze can be an effective learning alternative to improve early childhood motivation and visual-spatial intelligence.

4. Test Results Improve Children's Visual-Spatial Intelligence through a Cardboard Maze

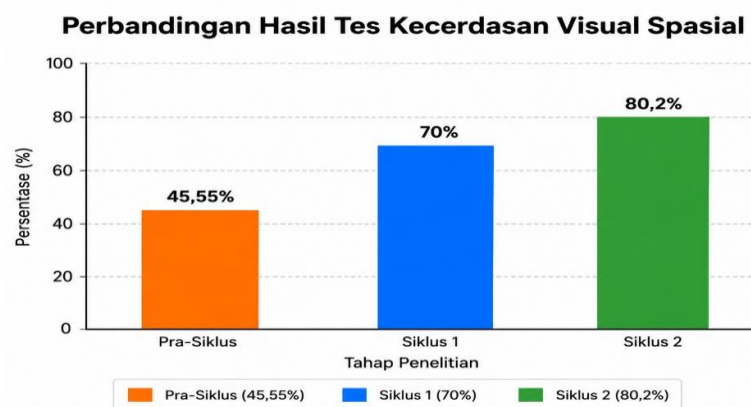


Figure 4
Comparison of Spatial Visual Intelligence Test Results Pre-cycle, Cycle 1, and Cycle 2

The results of the children's visual-spatial intelligence test through the application of cardboard maze games showed a significant increase in each cycle.

In the pre-cycle stage, the average achievement of children is only 45.55%, which means that children's visual-spatial abilities are still low. This is because previous learning activities have not involved concrete media so that children have difficulty understanding the concept of direction and space.

In the first cycle, the test results increased to 70%, or an increase of 24.45% compared to the pre-cycle. This improvement shows that cardboard maze games are starting to have a positive influence on children's abilities. Children are more enthusiastic and active in participating in learning activities, although some still need guidance to complete the maze path. Furthermore, in cycle II there was an increase again to 80.2%, or an increase of 10.2% from cycle I. This achievement is included in the Very Good category, which means that most children have been able to understand directions, recognize paths, and solve problems more independently through play activities.

Overall, the application of cardboard maze games has proven to be effective in improving children's visual-spatial intelligence because it provides a fun, interactive, and appropriate learning experience that matches the characteristics of early childhood development. This opinion is supported by Rosidah who states that maze games can improve children's visual-spatial skills because they provide concrete and fun learning stimulation (Rosidah, 2014). According to Rachmawati, maze play activities have a significant positive correlation with children's visual-spatial intelligence. This activity not only increases concentration, but also helps children in coordinating their eyes and hands to achieve goals (Rachmawati, 2019). Yulistari et al. found that the use of educational maze-shaped toys was effective in developing cognitive skills, especially visual-spatial intelligence. Children become more skilled at predicting paths, understanding directions, and recognizing patterns, which are key aspects of visual-spatial intelligence (Yulistari et al., 2019). Thus, the application of cardboard maze games as a learning medium not only provides an interesting learning experience, but also supports the achievement of children's cognitive development indicators optimally.

CONCLUSION

The conclusion of the results of the study after teachers and children applied cardboard maze games to improve children's visual-spatial intelligence at KB Ar-Rahman Tembilahan, learning by teachers experienced a significant increase at each stage. In the pre-cycle, teachers obtained a percentage of 52%, which shows that conventional methods are still dominant. After the implementation of the cardboard maze game in cycle I, the percentage increased to 83%, and in cycle II it reached 90%. This increase indicates that teachers are increasingly skilled in utilizing creative media to create learning that is interesting, interactive, and in accordance with the characteristics of early childhood. Meanwhile, children's activities also experienced positive development. In the pre-cycle, children's involvement was only 46%, which indicates a lack of enthusiasm and difficulty understanding the concepts of space and direction. After the implementation of the cardboard maze game, the achievement increased to 74% in cycle I, and again increased to 80.2% in cycle II. This shows that cardboard maze games are able to motivate children to be more active and improve their visual-spatial skills through concrete learning experiences.

The results of measuring children's visual-spatial abilities showed a noticeable improvement in each cycle. In the pre-cycle, the average achievement was only 45.55%, increasing to 70% in cycle I, and reaching 80.2% in cycle II. This data proves that cardboard maze games are effective in developing children's visual-spatial abilities because they involve thinking activities and motor movements simultaneously.

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