

The Effectiveness of Climanopoly Game-Based Learning Media to Improving Knowledge of Climate Change in the Aged 5-6 Years in Semesta Kindergarten Semarang

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Abstract: This study aims to study and analyze the effectiveness of using climanopoly media (Climate Monopoly) in improving knowledge of climate change in children aged 5-6. The background of this study is the lack of understanding of climate change in children aged 5-6 years at Semesta Semarang Kindergarten and the location of Semesta Semarang Kindergarten is close to the toll road area so a lot of carbon dioxide gas (CO_2) which can cause climate change. The research method used is quantitative with a one-group pretest post-test design. The population and sample in this study were children aged 5-6 years (TK B) at Semesta Semarang Kindergarten, totaling 40 children. Data collection was done by observation and oral question and answer with children. The data obtained were processed by normality test, homogeneity test, hypothesis test (paired sample t-test), and N-gain test using the help of SPSS 26. The average result of the pretest score was 8.93 and the average result of the post-test was 17.58, an increase in the average result of 8.65. Furthermore, the research result of the paired sample t-test significance test is $0.00 < 0.05$. It is H_0 rejected and H_1 accepted, meaning that there is a significant difference in improving knowledge of climate change in children aged 5-6 years at TK Semesta Semarang, with an N-gain value of 79.2%, meaning that the use of learning media based on climanopoly games is effectively used to improve knowledge of climate change in children aged 5-6 years.

Keywords: learning media, climanopoly game, climate change, 5-6 years old children.

INTRODUCTION

According to Law No. 20 of 2003 concerning the National Education System, early childhood education is a coaching process that will continue from the time the child is born until the age of six years (0 - 6 years). Early childhood is the fastest and most appropriate period in providing stimulation or stimulation to children because this period is called the golden age. This is in accordance with the opinion of Rijkiyani et al. (2022) which states that the golden age is a time when children undergo very rapid growth so at this time the stimulation of children's growth and development is useful for the next stage. According to the Standard Level of Child Development Achievement (STPPA) written in Permendikbud No. 137 of 2014, 6 aspects of child development need to be stimulated, namely religious and moral development, physical motor, cognitive, language, social emotional, and art. Early childhood is one of the great hopes for the future of the Indonesian nation. This can be seen from the perspective of early childhood education to realize the nation's golden child in 2045. The goal of PAUD development in Indonesia from 2015 to 2045 is to build quality human resources, fundamentals towards reliable human resources, delivering human resources that can compete globally and giving birth to comprehensive intelligent human resources (Directorate General of PNFI Kemendikbud, 2011).

In the era of the z generation, technological advances have developed rapidly, even technological advances have helped almost every human need and activity. The improving development of science and technology can also affect the mindset of the younger generation (Yafie in Nurlaela, 2023). Therefore, the role of government and society is very important to realize an education that can realize the ideals of the Indonesian nation if the younger generation is not equipped with appropriate knowledge, it will be left behind by other countries. That is why the importance of instilling scientific knowledge needs to be done early. One component to improve the quality of early childhood education in the community is to improve the quality of learning and the competence of educators. This is in line with Yafie's opinion in Nurlaela (2023) who said that educators are expected to have qualified competence in preparing learning tools and implementing learning by established standards. This is very necessary in preparing a smart and insightful golden generation. To realize this, the national standards and the 2013 PAUD curriculum emphasize that learning in PAUD institutions uses integrative thematic learning and a scientific approach.

Cognitive development is one aspect of development that needs to be stimulated in early childhood. This cognitive development is related to the intelligence possessed by the child. Children's cognition begins to develop based on the stimulus provided and the environment around the child, which is characterized by the child being able to express wishes and the child being able to convey the experiences they have (Zega, 2021). Providing stimulation is needed to develop children's cognition. This is the opinion of (Patmonodewo in Ardiati, 2021) that cognitive development is expressed by the growth of designing, remembering, and finding solutions to problems.

One of the educational activities based on a scientific approach that can be used to improve cognition and introduced to early childhood is children's understanding of the phenomena around us, one of which is climate. Climate is an integral part of children's daily environment, and early understanding of climate can contribute significantly to the development of their science literacy. This is by Piaget's view (in Hyun et al., 2020), that interactions between children and physical objects produce mature thinking. Climate change is a change in the pattern and intensity of climate elements over a comparable period (Sumampouw, 2019). Climate change is characterized by features such as improved warming of the earth, more carbon dioxide (CO₂) in the atmosphere, rising sea levels, reduced snow cover, and melting glaciers (Pinontoan et al., 2022). So, it can be concluded that climate change is a change in the intensity pattern of weather over several years that can be compared and occurs over a long period. The characteristics of climate change are characterized by increasing temperatures on earth, rising sea levels, and so on. Then, climate change is caused by several factors, such as greenhouse gases and global warming. Efforts to prevent climate change can be made by saving energy, 3Rs, public education and awareness, and conducting global agreements that aim to reduce gas emissions globally.

UNICEF says the world's children now bear the brunt of the risks to their ability to survive, grow and thrive from exposure to the impacts of climate change. Young children in Asia-Pacific who are vulnerable to climate change face an unequal burden of climate change impacts across all components such as health, nutrition, early learning, responsive care, and safety and security.

Climate understanding in early childhood is often overlooked in early childhood education curricula. In fact, the introduction of climate at this age can open the door to the development of understanding scientific concepts, observations, as well as the development of language and cognitive skills. Therefore, climate change education and awareness is a component that aligns with Sustainable Development Goals (SDGs) 13 related to climate action (McKenzie, 2024). In addition, early childhood is the most vulnerable group to the impacts of climate change and environmental degradation. It was mentioned in ARNEC (Asia-Pacific Regional Network for Early Childhood) that climate change action needs to involve early childhood to break the cycle of climate injustice because 90% of the global health burden associated with

climate change is borne by early childhood. Therefore, in-depth research is needed to understand how approaches can be applied in introducing the concept of climate change in early childhood. As stated by Malihah (2022) there is a need for learning to improve understanding of climate change and awareness of protecting the environment by starting good habits from an early age.

Learning for early childhood needs to be packaged in interesting activities. In addition, the use of media in the learning process can support and facilitate teachers in delivering material, especially for learning in early childhood. With interesting learning media, it can improve children's curiosity about the media. The use of media can have a positive impact on supporting learning facilities and the means of a teacher in carrying out the process of teaching and learning activities (Maghfiroh & Suryana, 2021).

Learning activities for early childhood can be carried out using game-based learning media. Based on the Regulation of the Indonesian Minister of Education, Culture, Research and Technology No. 12 of 2024 concerning Curriculum in Early Childhood Education, intracurricular activities are carried out with meaningful play activities, meaning that play activities are carried out by providing space for children to explore and provide fun experiences. Based on this, it is necessary to find ways to package play and learning that are appropriate for early childhood. As said Barnett (1990) that efforts to create a way to unite play and learning should be playing activities not only play and learning activities do not burden children. Here, researchers use a way to deliver material about climate change in early childhood packaged in climanopoly games.

Based on observations made by researchers at TK Semesta Semarang, it is known that TK Semesta Semarang is one of the early childhood education institutions in Semarang City which has complete facilities and infrastructure and uses a bilingual learning system with official teaching languages in Indonesian and English. Semesta Semarang Kindergarten is an educational institution that aims to prepare children who can play a role in social and cultural life based on noble character. The theme of learning about science at Semesta Semarang Kindergarten includes environment and nature, some examples of activities such as coloring the earth, experiments about the sun and shadows, and 3Rs. The learning material about science at Semesta Semarang Kindergarten is still lacking in depth, especially for material about climate change. Based on this, it appears that the introduction of climate change has not been delivered in-depth, but children have been introduced to the environment around them. So that it supports the introduction of climate change in more depth. Therefore, researchers want to use climanopoly games as a media used in learning about climate change.

Furthermore, Semesta Semarang Kindergarten is in the elite residential area of Graha Candi Golf. Housing development in this area affects soil conditions and water sources. Housing development involves human activities in utilizing the land used for housing Jayadinata (in Setyawan & Pigawati, 2018). Housing development has an impact on the surrounding environment because housing development activities can cause changes in the physical and socio-economic environment both at the construction site and its surroundings. Based on the results of the impact analysis of the Graha Candi Golf housing development conducted by Setyawan & Pigawati (2018) stated that the negative impact caused is that it causes less water to seep into the ground so that the availability of well water sources is reduced, besides that RW 1 is in a zone prone to land movement disasters.

Then, the location of TK Semesta Semarang is in an area that is quite close to the toll road. Semarang City Bappeda in Sofaniadi (2019) describes that the pattern of activities of the people of Semarang City is the movement from home to work, trade, or education, it is routine and daily. The proximity of the school location to the toll road causes many vehicles to pass by, emitting carbon dioxide gas (CO_2). Indirectly, this has an impact on increasing greenhouse gas emissions that can cause global warming and lead to climate change.

The next reason is the novelty of the climanopoly game, which is related to the material given to children. The material or theme raised in the climanopoly game is about climate change which has not been widely praised as a research topic for early childhood. How to play climanopoly is almost the same as the monopoly game. The difference is that monopoly is about the country while climanopoly is about climate change. In addition to introducing knowledge related to climate change, climanopoly games can train children to count, and train honesty. Climanopoly media was developed because many activities can be done such as getting rewards, question-and-answer activities, and obtaining information. Monopoly media is a game-based media, which will make children happy and not bored during learning (Suriantara, 2022).

Related to the description above, related to the description above, researchers are interested in conducting research by utilizing climanopoly games to convey to children things related to climate change in early childhood. This research will be carried out on children aged 5-6 years at Semesta Semarang Kindergarten. The research will be carried out using quantitative methods to know the effectiveness of climanopoly game-based learning media in improving knowledge of climate change in children aged 5-6 years, so the researcher raised the title "The Effectiveness of Climanopoly Game-Based Learning Media in Improving Knowledge of Climate Change in Children Aged 5-6 Years in Semarang Universe Kindergarten".

Monopoly game is a game that aims to control land plots through buying, renting, and exchanging property in a simple economic system. In the monopoly game, players compete to accumulate wealth. According to (Husna in Harahap & Fitria, 2023), monopoly is a game that uses a set of games consisting of a game board, pawns, dice, opportunity cards, general funds, money, houses, and land buyer cards. Furthermore, climanopoly game is a game-based learning media adapted from the monopoly game. Climanopoly stands for Climate Monopoly which means climate monopoly. The rules in the climanopoly game are almost the same as the monopoly game in general, except that the buying and selling transactions are replaced by giving rewards. In addition, what distinguishes monopoly games and climanopoly games is the material or content contained in the game. In the climanopoly game, each plot contains climate change material, while each plot of the monopoly game contains the names of countries. In the climanopoly game, players must be ready to answer questions on quiz cards and behavior checks and must be ready to listen to information contained in information cards. The climanopoly game requires the intelligence, focus, and assertiveness of each player in answering questions. So that players get as many rewards as possible. The use of climanopoly game media aims to make it easier for children to learn material about climate change. Knowledge of climate change is very important for early childhood so that children are more aware of climate change that is currently happening in the surrounding environment. Awareness of the importance of the environment needs to be instilled and carried out from an early age (Faizal et al., 2022). The benefits obtained by children from climanopoly games are adding insight and knowledge for children about climate change, then children know what impacts are caused by climate change, such as natural disasters, high rainfall, prolonged rains, and so on. The next benefit is that children know how to prevent climate change, such as saving energy, 3Rs, planting trees, and so on. The next benefit is that children are more concerned with phenomena that occur in the surrounding environment.

Previous research on the use of monopoly media can affect speaking skills in children aged 5-6 years (Jauhari et al., 2023). Other research findings also state that the MOKU monopoly game has an influence and is effective in improving the sense of love for the country in children aged 5-6 years (Ningsih et al., 2023). The results of further research show that there is an effect of using media to develop good manners in children aged 5-6 years (Asih & Maranatha, 2022). Although some learning media adapted

from the monopoly game have been developed, none have specifically discussed and used this monopoly game to improve climate change knowledge in children aged 5-6 years. Therefore, this study developed the climanopoly media to fill this gap. The purpose of this study is to determine the effectiveness of using climanopoly game-based learning media in improving knowledge of climate change in children 5-6 years. The following is the design of the climanopoly game.



Figure 1. Climanopoly Game Design

METHODS

This research was conducted at Semesta Kindergarten Semarang. The research method used was quantitative with a one-group pretest post-test research design. This design is presented in Table 1.

Table 1. Draft Research Design

Pretest	Treatment	Post-test
O_1	X	O_2

Source: (Dewi & Wardani, 2020)

The research subjects in this study were kindergarten B students aged 5-6 years at TK Semesta Semarang. Data collection techniques used were observation and direct question and answer with children. Observation was carried out to know the problems that occur in the field. Furthermore, questions and answers with children were used to collect research data. Pretest and post-test were conducted by question and answer with the children, then the treatment was given 12 times. The research instruments used were questions (tests) with scoring using the Guttman scale reference. Furthermore, the research instrument was tested on children to carry out validity tests and reliability tests using Cronbach's alpha. According to (Arikunto in Farkhati & Nugroho, 2020) validity is a measure that shows the level of validity and validity of an instrument. Furthermore, an instrument can be declared reliable if the same data is obtained from two or more researchers in an object (Nurrohman, 2020). Hypothesis testing using paired sample t-test and finally the N-gain test.

RESULT AND DISCUSSION

Result

Based on the results of the validity test conducted, it shows that the question items that have been made by researchers on the climate change knowledge variable, there are 20 valid question items and 5 invalid question items. Furthermore, the results of the instrument reliability test obtained data as shown in Table 2.

Table 2. Reliability Test Results

Cronbach's Alpha	N of Items
.716	25

(Source: Primary Data)

Based on Table 2 reliability test result, the reliability test result is 0.716. Based on the reliability criteria table above, it can be concluded that the reliability test results in this study are $0.60 \leq 0.716 \leq 0.80$ high category.

Based on the results of the data analysis carried out, the data results are show in Table 3.

Table 3. Data Analysis Results

Statistics	Pretest	Posttest
Mean	8.93	17.58
Median	9	18
Variance	4.174	3.328
Standard Deviation	2.043	1.824
Minimum Score	6	12

(Source: Primary Data)

Based on the data results in Table 3 data analysis result, it is known that the average post-test score is higher than the average pretest score. With the acquisition of the average post-test score of 17.58 and the average pretest score of 8.93, meaning that there was an improve in the average score of 8.65. Furthermore, to test the hypothesis, first conduct a prerequisite test of analysis, namely normality test and homogeneity test.

Furthermore, the increase in children's cognitive knowledge was divided into 5 categories, namely very low, low, medium, high, very high. The category was determined using the five-scale Benchmark Assessment (PAP) conversion guidelines. The level of cognitive development obtained by children is converted by comparing the results of the average child's score with the benchmark reference assessment criteria (PAP). The table used in this study was adapted from Agung's Benchmark Assessment (PAP) table (in Anandari et al., 2021) as follows:

Table 4. Categories of Pretest and Post-test Mean Scores

Percentage of Cognitive Development	Cognitive Development Criteria
18-20	Very high
16-18	High
13-16	Medium
11-13	Low
0-11	Very low

(Source: Primary Data)

Based on table 4 categories of pretest and post-test mean scores, the average pretest score of 8.93 is in the very low category and the average post-test score of 17.58 is in the high category. The difference between the pretest and post-test averages is 8.65, so there is an increase in climate change knowledge in the use of climanopoly games.

The following normality test results can be seen in Table 5.

Table 5. Normality Test Results

Tests of Normality			
Kolmogorov-Smirnov ^a			
	Statistic	df	Sig.
Pretest	.127	40	.103
Post-test	.126	40	.108

(Source: Primary Data)

Based on the results of the Tabel 5 normality test result, it can be concluded that the data in this study are normally distributed, because the Kolmogorov-smirnov value in this study has a significance value of $0.103 > 0.05$ and $0.108 > 0.05$. So it can be said that the data is normally distributed. Furthermore, the results of the homogeneity test can be seen in Table 6.

Table 6. Homogeneity Test Results

Test of Homogeneity of Variances					
		Levene	df1	df2	Sig.
		Statistic			
Results	Based on Mean	1.439	1	78	.234
	Based on Median	1.408	1	78	.239
	Based on Median and with adjusted df	1.408	1	76.924	.239
	Based on	1.489	1	78	.226

trimmed
mean

(Source: Primary Data)

Based on the results of the Table 6 homogeneity test result, it is known that the significance value of Based on Mean is $0.234 > 0.05$, it can be concluded that the data is homogeneous (the same).

After the prerequisite analysis test is carried out, the next step is to test the paired sample t-test hypothesis. The results of the paired sample t-test can be seen in Table 7.

Table 7. Paired Sample t-test Results

		Paired Sample Test						
		Paired Differences						
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference	t	df	Sig. (2-tailed)
					Lower	Upper		
Pair 1	Pretest- Posttest	-8.650	1.762	.279	-9.214	-8.086	-31.046	.000

(Source: Primary Data)

Based on the table above, the test results using the paired sample t-test obtained a significant value of 0.000. It can be said that $0.000 < 0.05$ so that the data is said to be effective, then H_0 rejected and H_1 accepted. This means that there is a significant difference in improving knowledge of climate change in children aged 5-6 years in Semesta Semarang Kindergarten. The last test conducted in this study was the N-gain test. The results of the N-gain test can be seen in Table 8.

Table 8. N-Gain Test Results

Deskriptif Statistic					
	N	Min	Max	Mean	Std. Deviation
Ngain_score	40	.43	1.00	.7920	.14277
Ngain_presentase	40	42.86	100.00	79.2015	14.27669
Valid (listwise)	N = 40				

(Source: Primary Data)

Classification criteria for the effectiveness of N-gain according to Hake (in Wahab et al., 2021) are as follows:

Table 9. Criteria for the Effectiveness of N-gain

Average	Interpretation
< 40	Ineffective
40-55	Less effective
56-75	Effective enough
> 76	Effective

(Source: Wahab et al., 2021)

N-gain score categories according to Hake (in Puspita & Suminar, 2022) as follows:

Table 10. N-gain Score Categories

N-gain value	Category
$g < 0,7$	High
$0,3 < 0,7$	Medium
$g < 0,3$	Low

(Source: Puspita & Suminar, 2022)

Based on the results of Table 8, the N-gain value is 79.2015 or 79.2%. based on the N-gain level criteria table, the results with a value of 79.2% are included in the effective and high categories according to Tables 9 and 10. This means that the use of climanopoly media is effective in efforts to recognize climate change in children aged 5-6 years.

Discussion

Based on the analysis that has been done, in the normality test stage, the pretest significance value = 0.103 and the post-test significance value = 0.108. The significance value > 0.05, so the data in this study are normally distributed. Furthermore, namely the homogeneity test, the value obtained based on the Sig. value based on Mean is obtained at 0.234 > 0.05, so the data is said to be homogeneous. Then the paired sample t-test was conducted. In the paired sample t-test, a significant value of 0.000 < 0.05 was obtained, meaning that there was a difference in the average knowledge of students in the pretest and post-test results. The increase in climate change knowledge can be seen with the average pretest result of 8.93 and the average post-test result of 17.58. Based on this data, there was an increase in pretest and post-test results of 8.65. Based on the results of the pretest and post-test, it shows that there is an increase in knowledge of climate change in children aged 5-6 years using learning media based on climanopoly games. So, it can be concluded that H_0 is rejected and H_1 is accepted, meaning that there is a significant difference in improving knowledge of climate change in children aged 5-6 years at TK Semesta Semarang.

Furthermore, the N-gain test was conducted to measure the effectiveness of using climanopoly game-based learning media to increase knowledge of climate change in children aged 5-6 years at Semesta Semarang Kindergarten. The N-gain test was conducted using the help of SPSS 26. After testing, the average N-gain score was 79.2%. According to Hake (in Wahab et al., 2021), the average N-gain score falls into the effective category and according to Hake (in Puspita & Suminar, 2022) the average N-gain score falls into the high category. Thus, the use of learning media based on climanopoly games is effective in efforts to increase climate change in children aged 5-6 years at Semesta Semarang Kindergarten.

In this study, climate change knowledge in children aged 5-6 years has increased. The increase in children's climate change knowledge can be seen from the average results of the pretest and post-test that have been passed by children. The increase in climate change knowledge is due to the addition of learning media based on climanopoly games. The results of this study are supported by previous research conducted by Jauhari et al. (2023) with the research title "The Effect of Playing Monopoly Letters on the Speaking Ability of 5-6 Year Old Children at Telkom Makassar Kindergarten" which found that monopoly game media had an effect on speaking ability in children aged 5-6 years. Then it is also supported by previous research conducted by Jaya et al. (2023) with the research title "The Effect of Using Monopoly Game Tools on Early Childhood Cognitive Skills at RA Shazia Palembang" which found that using monopoly games can improve cognitive abilities in children aged 5-6 years. In addition, based on the results of the N-gain test conducted by researchers, it shows that the use of climanopoly game media in the introduction of climate change is in the effective category. And supported by research conducted by Tumanggor et al. (2023) entitled "Climate Change Mitigation and Adaptation Efforts through Atteropoly Children's Game Media to Elementary School-Age Children" shows that Atteropoly children's game media can increase knowledge about waste management in elementary school-age children in Bogak Village. After giving treatment, students are able to know what climate change is, what are the causes of climate change, then how good activities to save energy, and how to protect the earth, and students also know the difference between oxygen gas (O₂) and carbon dioxide (CO₂) simply. Furthermore, the use of learning media based on climanopoly games helps make the atmosphere in the classroom more active and fun, then helps students focus more on learning, increase student motivation, and interest in learning, and provide different learning experiences for students

CONCLUSION

Based on the results of research and discussion of the effectiveness of climanopoly media in the effort to recognize climate change in children aged 5-6 years at Semesta Semarang Kindergarten, the results show that the significance value in the paired sample t-test obtained a value of 0.000 < 0.05, meaning that the hypothesis H₁ accepted, which states that there is a significant difference in the increase in knowledge of climate change in children aged 5-6 years at Semesta Semarang Kindergarten, and the hypothesis is H₀ rejected. Furthermore, the use of climanopoly game media to improving knowledge of climate change obtained an N-gain value of 79.2%, meaning that climanopoly game media is effective in efforts to increase knowledge of climate change in children aged 5-6 years at Semesta Semarang Kindergarten. Furthermore, the use of game-based learning media, Climanopoly, helps to make the classroom atmosphere more active and enjoyable, then helps students focus more on learning, increases students' motivation and interest in learning, and provides a different learning experience for students.

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