ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 337

Padang International Conference on Educational Management and Administration (PICEMA 2018)

Increasing Cognitive Development of Children through Science Games in PAUD Permata Bunda B2 Group in Lembah Gumanti, Solok Regency

Oktawisra
Early Childhood Education
Faculty of Education, Universitas Negeri Padang
Padang, Indonesia
oktawisra@gmail.com

***Abstract*-This study was motivated by the low cognitive abilities of the B2 BUD group Permata Bunda children in Lembah Gumanti Subdistrict, Solok Regency. The aim of the study was to improve cognitive development of children through science games. The type of research used is classroom action research (CAR) with two cycles. The research subjects were children in the BUD ECD B2 group in Lembah Gumanti, Solok Regency with a total of 15 children, 8 men and 7 women. The data collection technique used is in the form of observation sheets and interviews, then the format of the assessment results is processed using percentage techniques. The results showed that there was an increase in children's cognitive development. In the first cycle, it was still low with a percentage of completeness value of 29.3%. Then continued in the second cycle of cognitive development of children experienced an increase of 81% and showed positive results. This is because learning is obtained through the activities of science games designed by teachers with creativity. Thus it can be concluded that science games can improve children's cognitive development.**

Keywords— science games; cognitive development

I. INTRODUCTION

Early childhood is an object of education because at this time is the golden age of child development. At this time is the first basis of personal formation and maturity both brain and physical. Child development is integrative both physical, motoric and cognitive development. These three aspects of development can be developed either at the institution of education or at home. One of the institutions is Early Childhood Education (PAUD). PAUD is Kindergarten (TK) which is a form of formal education that provides educational programs for children aged 4-6 years before entering primary education. Through early childhood education can produce quality human resources and shape children who have character in the life of a nation and dignity, all children must get guidance and direction from the teacher in order to grow and develop optimally.

In this educational institution professional teachers are needed in developing the ability of early childhood. teacher professionalism is highly demanded to be more creative in modifying and utilizing existing media, so that all aspects of child development can run properly. So when playing with guidance, the teacher provides, chooses and then attempts to guide so that the child finds a concept that has been planned by the teacher especially in the cognitive development of the child.

Based on the fact that researchers do cognitive development of children is still low and has not developed according to the stage of cognitive development of children as well as it should. For example, when a teacher introduces geometric forms there are still many children who do not know the shape of a triangle, a circle and so on. This is caused by several factors from within the child and from outside the child, such as the tools and media in kindergarten are less varied so learning is not attractive to children and teachers are less creative in learning to develop children's cognitive specifically.

When the teacher explains about science knowledge to children, the child seems unable to follow it properly. Children seem less interested in the material taught by the teacher.

From the results of preliminary observations conducted on 15 children with four indicators, children's cognitive development is still very low. This can be seen in the first indicator where 80% of the number of children have not developed, as well as the second, third and fourth indicators of children's cognitive development has not developed as expected.

Based on the above phenomenon, the researcher is interested in discussing this issue in a thesis entitled: "Improving Children's Cognitive Development through Science Games in Permata Bunda ECD B2 Group in Lembah Gumanti Subdistrict, Solok Regency

II. THEORY STUDY

Developmental is a process that is experienced by individuals and qualitative relating to one's maturity [1]. These changes occur continuously in individuals from birth to the end of life, including changes that individuals experience towards maturity or maturity. Development can also be interpreted as a process that is experienced by each individual that is qualitative and related to one's maturity.

One aspect of human development related to understanding (knowledge), namely all psychological processes related with how individuals learn and think about

their environment is referred to as cognitive development [1]. Cognitive development describes how a child's mind develops and functions so that it can function in a process that occurs intellectually in the center of the nervous system while thinking. Cognitive development concerns the development of thinking and how thinking activities work [1] [2] [3].

The goals of cognitive development for preschoolers are as follows: 1) develop the power of perception based on what is seen, heard and felt, 2) trains the memory of all events and events that have been experienced, 3) develops thoughts in order to connect one event with other events, 4) understanding the symbols scattered around the world, 5) carrying out reasoning, 6) solving life problems that face them. In addition, the purpose of cognitive development is to find solutions to problem solving, understand and use symbols that exist around a child's life [2].

Cognitive development characteristics consist of: 1) children increasingly independent and begin to get closer to their peers, 2) their egocentric feelings are still strong, 3) difficult to distinguish imagination from reality, 4) asking questions more often, 5) the longest period in life span, 6) difficult times, grouping, exploring, 7) the period of asking, imitating and the golden age. The characteristic of cognitive development in early childhood is to imitate the activities of adults, often asking questions and finding it difficult to distinguish between reality and imagination.

Playing (*play*) is a term that is used freely, the most appropriate meaning is any activity that it causes, without considering the final result. Playing is done voluntarily and there is no coercion or external pressure or obligation. Playing consists of responses that are repeated just for functional pleasure ... besides playing is an activity that has no other rules except those set by the player himself and there are no final results intended in external relations, fun activities without coercion that are generally carried out by children and can develop imagination in children.

The purpose of play is for children's health, increasing affiliation with peers, reducing pressure, improving cognitive development, increasing roaming power and providing safe shelter for potentially dangerous behaviors. Playing for children is very useful to develop aspects of child development such as cognitive, physical, social, emotional and aims for children's health [5].

Characteristics of children's play are as follows: 1) play is voluntary, 2) play is the choice of children 3) play is a fun activity, 4) play is symbolic, 5) play is active in doing activities. In addition, the characteristics of play include the following: 1) fun and encouraging for children, 2) children do it because they are spontaneous and voluntary, 3) children act pretend or act something, 4) all children participate together according to their respective roles each, 5) encouragement to play appears from the child not coercion by others, 6) the child is active, 7) the child determines to play alone, 8) the child is free to choose to play [6].

The benefits of playing for children require considerable time to develop themselves through playing. Some of the benefits of playing for children are as follows: 1) triggering creativity, 2) educating the brain, 3) tackling conflict, 4) training empathy, 5) sensory, 6) media therapy (treatment), 7) playing doing discoveries Besides playing giving benefits for developing children themselves, including educating children's brains, developing children's creativity and useful for children's health [6].

According to the Big Indonesian Language Dictionary science has a definition as a systematic knowledge of determining the nature or principle of a matter obtained from observation, research, and testing. Through science, children find ideas and learn scientific facts. Children have their own interest in learning. Furthermore, Lind added that children want to learn and naturally look for problems to solve. The characteristics and actions of these children indicate that the child is involved in scientific thoughts and actions long before the child enters school. This is in accordance with the view of science, namely learning about facts and ideas.

The purpose of science learning for early childhood is to develop various capabilities, among others: 1) exploration and investigation, namely observing and investigating natural objects and phenomena, 2) developing basic science process skills, including observation, measurement, using numbers, and dividing observations , 3) developing curiosity, pleasure, and discovery by using inquiry, 4) understanding knowledge of the characteristics, structure, and function of objects [7]. So with children's science can develop a variety of abilities, such as exploration and investigation, curiosity, patterns and relationships, variety, diversity of structures and functions, and can develop basic skills of science.

Science games have advantages including: 1) attracting the interest of children because according to the needs of AUD, namely playing, 2) making children more confident with the results because based on the results of the experiments directly, 3) making children more creative and independent. In addition to these advantages science games also have disadvantages, namely: 1) this method requires a variety of equipment and material facilities that are not always easy to obtain, 2) requires patience and tenacity, 3) each experiment does not always provide the expected results.

III. METHOD

Type of research is in the form of classroom action research (CAR), namely research in the form of actions raised by the teacher in an effort to solve the learning problems it faces, to improve the quality of learning and try new things in the field of education. There are four times that must be passed in this study: 1) Planning, 2) Implementation, 3) Observation or Observation and 4) Reflection [8].

The subjects in the study were the B2 BUD ECD PAUD Lembah Gumanti, Solok District, with 15 students consisting

of 8 men and 7 women. This research was conducted in November 2014. The instruments used in this study were performance, observation and documentation.

IV. RESEARCH RESULT

A. Description of the Initial Condition

Based on observations made on the Premata Early Childhood ECD Group B2 children the initial development of a child's cognitive abilities is still relatively low. This can be seen in the following table:

TABLE I. LEVEL OF COGNITIVE ABILITY PRATINDAKAN CLASS

No	Indicator	Value							
		B		MB		BSB		BSB	
		No.	of %	No.	of %	No.	of %	No.	of %
1	Getting to know a variety of simple concepts everyday life	10	67	5	33	0	0	0	0
2	Know simple science concepts	3	20	12	80	0	0	0	0
3	Able to group science games	11	73	4	27	0	0	0	0
4	Invite friends to play simple science	10	67	5	33	0	0	0	0

Based on the table above the level of cognitive abilities of children in the PAUD B2 group Permata Bunda before the first indicator of action recognizes a variety of simple concepts in children's daily lives more dominantly in the developing new category percentage of 67%, the second indicator is that the simple science concepts of children are more dominant in the category of developing 80%, the third indicator is able to group Children's science games are more dominant in the new developing category, the percentage is 73% and the fourth indicator invites friends to play more simple children's science dominant in the new category with a percentage of 67%.

B. Description of Cycle I

Cycle I was conducted in 2 meetings. The first meeting was held on 19-20 November 2014 and the second meeting on 24-25 November 2014. Description of the implementation of learning in the first and second meetings of the first cycle as follows:

TABLE II. RESULTS OF FIRST MEETING CYCLE I OBSERVATION

No	Indicator	Value							
		BB		MB		BSB		BSB	
		Tot	%	Tot	%	Tot	%	Tot	%
1	mention and recognize geometric shapes	8	53	6	40	1	7	0	0
2	able to imitate geometric shapes	6	40	7	47	2	13	0	0
3	recognize basic and primary colors	6	40	7	47	2	13	0	0
4	Know the cause	5	33	7	47	3	20	0	0

Based on the table above, it can be seen that the results of observations in the first cycle of the first meeting showed the cognitive development of children from the aspect of mentioning and recognizing the geometric shapes of what was done in science game activities showed results that had not well developed. This is evidenced by the percentage level of children who have not been able to answer questions, namely 53.3% or 8 children. Whereas those who have already begun to be able to mention and recognize geometric forms are only 40% or 6 children from 15 children in total. Overall aspects assessed, 41.6% of children who have not developed cognitively and 44.9% of children who started developing. Whereas children who have developed as expected and developed very well still show a low percentage.

The cause of the high percentage of children who have not been able to mention and recognize geometric forms in science games is because science games are a new method of improving children's cognitive so that they require situations that make children familiar with the purpose of the game. The habit of children doing game centers causes the purpose of science games to require several meetings to familiarize children.

TABLE III. RESULTS OF CYCLE I OBSERVATION SECOND MEETING

No	Indicator	Value							
		BB		MB		BSB		BSB	
		Tot	%	Tot	%	Tot	%	Tot	%
1	Know various simple concepts of daily life	4	27	3	20	5	33	3	20
2	Know simple science concepts	3	20	6	40	3	20	3	20
3	Able to group science games	4	27	5	33	6	40	0	0
4	Invite friends to play simple science	3	23	20	60	1	7	2	13

Indicator 1, the child is said to have not developed if the child has not been able to mention forms and recognize geometric shapes in science game. Children are said to start developing when children are able to mention forms and recognize geometric shapes in science games. Children are said to develop according to expectations when children are able to mention and recognize geometric forms in science games but still need teacher guidance. Children are said to develop very well if they can mention and recognize geometric forms in science games without teacher guidance.

Indicator 2, children are said to have not developed if children have not been able to imitate geometric forms. Children are said to start developing when children are able to imitate geometric shapes. Children are said to develop according to expectations when children are able to imitate geometric forms but still need teacher guidance because they are not so perfect. Children are said to develop very well if

children can imitate geometric shapes without teacher guidance.

Indicator 3, the child is said to have not developed if the child has not been able to recognize basic colors and primary colors. Children are said to start developing when children begin to be able to recognize basic colors and primary colors. Children are said to develop according to expectations if children can recognize basic colors and primary colors but still need teacher guidance because it is not so perfect. Children are said to develop very well if children can recognize basic colors and primary colors without teacher guidance.

Indicator 4, children are said to have not developed if the child has not been able to recognize cause and effect. Children are said to start developing when children begin to be able to recognize cause and effect. Children are said to develop according to expectations if children can recognize cause and effect but still need teacher guidance because it is not so perfect. Children are said to develop very well if children can recognize cause and effect without teacher guidance.

Based on the results of observations in the first cycle of the first meeting, the cognitive development of children from the aspect of mentioning and recognizing the geometric shapes of what was done in science game activities showed results that were not well developed. This is evidenced by the percentage level of children who have not been able to answer questions, namely 53.3% or 8 children. Whereas those who have already begun to be able to mention and recognize geometric forms are only 40% or 6 children from 15 children in total. Overall aspects assessed, 41.6% of children who have not developed cognitively and 44.9% of children who started developing. Whereas children who have developed as expected and developed very well still show a low percentage.

The cause of the high percentage of children who have not been able to mention and recognize geometric forms in science games is because science games are a new method of improving children's cognitive so that they require situations that make children familiar with the purpose of the game. The habit of children doing game centers causes the purpose of science games to require several meetings to familiarize children.

While the observation data of the first cycle of meeting II shows an increase in child development in terms of the ability to imitate geometry. This can be seen from the percentage increase of 53.3% that has not developed in the first cycle of meeting I dropped to 26.6% in the second meeting of cycle I. This means that the number of undeveloped children has begun to be able to show cognitive development. In the second meeting, there were also children who had developed in terms of imitating geometric shapes even though they needed teacher guidance. There are 29.9% of children who develop well. This shows an increase in children's cognitive development when compared with the first cycle of meeting I, which still does not appear to be a child capable of imitating geometric shapes. Also seen in this second meeting were some children who had begun to develop both cognitively without direction and guidance, meaning that children began to be able to imitate geometric shapes without being instructed by the teacher. The BSB at the second meeting was 13.3%.

From the data above, it can be concluded that children's cognitive development is still at a low stage. This can be seen as 46.6% of children who have not developed cognitive in the first meeting of the first cycle and 23.3% in the second meeting. Whereas children who started developing at the first meeting of the first cycle were 44.9% and 43.3% in the second meeting. The ability of BSH in the first cycle of meetings was 13.3% and rose to 29.9% in the second meeting. Likewise, the BSB in the first cycle of meeting I that did not yet exist increased at the second meeting to 13.3%. Can be seen from the graph below:

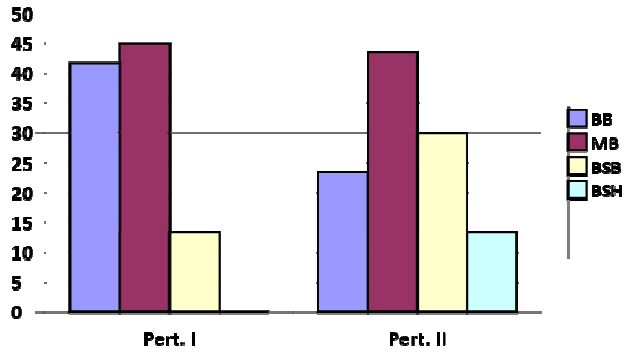

FIGURE 1. GRAPH COMPARISON OF THE FIRST AND SECOND

Meetings From the two meetings in the first cycle, the researchers saw that the children had not reached the level of completeness of the targeted development. Then in accordance with the provisions of the PTK research, if in the first cycle it has not reached the expected development, then the research will continue in the next cycle

Reflection activities are carried out collaboratively between researchers and observers. From the collaboration results it is known that the implementation of learning about children's cognitive enhancement through science play activities in the first cycle, there are a number of shortcomings, both from the researchers and from the children themselves. The problem that become a concern for the next cycle is:

1. Children while participating in playing in science games, children are still busy with their respective activities so that the learning process to develop children's cognitive has not run optimally.
2. The location that was used was not attractive enough for the children
3. to pay attention to the circumstances around them.
4. Children are still unfamiliar with learning outside the center.

The above reflection is a reference for researchers to take action in the next cycle. In the first cycle, the indicator of the success of the research has still not been achieved, it needs to be continued in the next cycle to reach the desired target.

Based on the exchange of opinions and input from observers, then in the second cycle improvements will be made especially to attract the attention of children in order to be able to focus on doing science games activities. Second, do a more interesting science game so that children are interested in participating in activities and learning, interspersed with interesting short stories so that playing is not monotonous and does not saturate children.

C. Description of Cycle II

Cycle II was held twice. Descriptions of learning at the first and second meetings are as follows:

TABLE IV. RESULTS OF CYCLE II OBSERVATION FIRST MEETING

No	Indicator	Value							
		BB		MB		BSB		BSB	
		Tot	%	Tot	%	Tot	%	Tot	%
1	Know various simple concepts of daily life	1	7	3	20	6	40	5	33
2	Understanding simple science concepts	2	13	2	13	6	40	5	33
3	Able to classify science games	2	13	4	27	4	27	5	33
4	Invite friends to play simple science	2	13	6	40	5	33	2	13

From meeting data I meeting cycle II it is seen that children who have not developed aspects in terms of aspects mention and recognize geometric forms only 6.6% or 1 child. While children who are still undeveloped in the aspect of ability to imitate geometric shapes only have 2 children or 13.3%. Overall aspects assessed, children who are still in the BB category at the first meeting of the second cycle are only 11.6%, MB 24.9%, BSH 34.9% and BSB or have developed according to expectations reaching 28.3%. This shows a good development because at the 3rd meeting of this study the child has shown significant development.

Judging from cognitive development among children, this increase is felt to be very significant, because there are some children who have high absorption so that the child is able to recognize causation well. This is certainly a cognitive development benchmark for children aged 4-5 years cannot be equated with cognitive development of children over their age.

TABLE V. RESULTS OF CYCLE II OBSERVATION SECOND MEETING

No	Indicator	Value							
		BB		MB		BSB		BSB	
		Tot	%	Tot	%	Tot	%	Tot	%
1	Know various simple concepts of daily life	0	0	3	20	4	27	8	53
2	Understanding simple science concepts	1	7	2	13	4	27	8	53
3	Able to group scientific games	1	7	3	20	4	27	7	47
4	Invite friends to play simple science	0	0	4	27	6	40	5	33

Obtaining the results of research observations in the second cycle of the second meeting showed better results. It can be seen that there are no more children who are only silent during science games, children are actively involved. So the observations show that children who have been able to imitate geometry without the help of teachers have reached 53.3%. Overall, the assessed aspects show that children who are still not able to do or BB category at this second meeting is 3.3%, MB assessment category is around 22.7, BSH category is 29.3% and child categories that have developed are in line with expectations reaching 51 , 6 percent. If accumulated children who have developed well and very well have reached 81%. This already shows that science games can actually improve children's cognitive development.

Indicators that are made are based on the ease of getting to a more difficult level. Making it easier to control the development of children. At the second meeting of the second cycle the child has shown better cognitive development. Where the ability of children to ask questions, express opinions, criticize and defend opinions shows good development

From the two explanations of the data above, it can be seen that the percentage of undeveloped in the second cycle of meeting I was 11.6%, while the second meeting fell to 3.3%. Here there is a reduction in undeveloped children towards better development. Children who start developing or MB at the first meeting of the second cycle are 24.9%, while the second meeting becomes 22.7%. Children who have developed but still need teacher guidance at meeting I cycle II 34.9% while meeting II is 29.3%. But better development without teacher guidance again at the first meeting of the second cycle was 28.3%, at the second meeting it increased to 51.6%. This proves that cognitive development occurs in children during science games. Below is a graph of the results of cycle II of meeting I and meeting II:

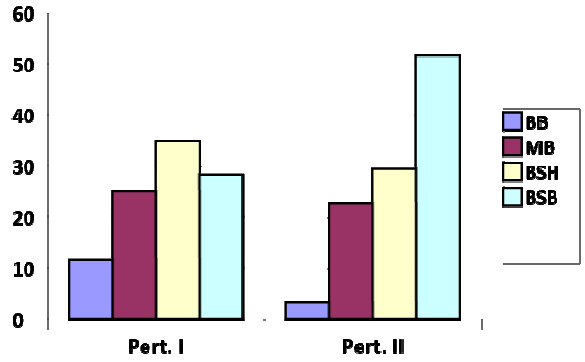

FIGURE 2. GRAPH OF COMPARISON OF THE FIRST ANDMEETINGS SECOND

Based on the final results in the second cycle of the second meeting, it can be concluded that the research improves children's cognitive development through game activities, namely achieving completeness 81% (BSH + BSB)

Reflection activities in the first cycle were carried out collaboratively between researchers and observers at the end of learning. Based on the results of the collaboration, it can be seen that the learning process about children's cognitive development in Permata Bunda ECD Lembah Gumanti Subdistrict, Solok Regency can be summarized as follows:

1. Children have followed the game process as expected.
2. The location and media used are in accordance with the learning material.
3. Children have shown a preference for learning because it is more varied, both the location of the play and the way the teacher guides the child.

Based on the description above it can be concluded that in the second cycle of meeting II the cognitive development of children has shown good development, because of the four indicators of assessment has revealed the expected development. This is evidenced by the assessment of children who have not been able to do it according to the indicators specified shows a low percentage, as well as the assessment of children who start developing there is also a low percentage. There is an increase in the assessment of children who are developing well and developing as expected.

From the research conducted on the learning process of cognitive development through science games, the researchers saw an increase in cognitive development among children. Can be seen from the table in the activities of the first cycle and the second cycle above.

V. DISCUSSION

Based on the results of the research and discussion it can be concluded that the learning outcomes obtained through science play activities at Permata Bunda ECD in Lembah Gumanti, Solok Regency were carried out in 2 cycles. Cycle I consisted of 2 meetings with completeness scores only reaching 29.3%. In the second cycle there was an increase of 51.6% so that in the second cycle consisted of 2 meetings the value of completeness increased to 81%. Based on the results of the research obtained, the researchers put forward some suggestions as follows:

1. For Teachers
   a. Before the implementation of the learning process the teacher needs to make a plan, so that learning goes well, effectively and efficiently.
   b. Teachers must have creativity in creating learning situations so that learning is not too monotonous.
   c. The teacher must be able to choose the right media and methods to improve the desired learning achievement.
   d. The teacher must be able to become a motivator and facilitator for his students.
2. For Principals
   a. Giving freedom to teachers to develop their abilities in order to increase children's knowledge.
   b. Provide direction to the teacher to be creative in carrying out the learning process, such as choosing and using learning media that is appropriate to the theme being taught.
   c. Give an assessment to the teacher, if there are outstanding teachers need to be rewarded or rewarded.

References

[1] Desmita. (2013*). Developmental Psychology*. Bandung: Remasaja Rosda Karya.
[2] Suyanto, Slamet. (2005). *Basic Concept of Early Childhood Education*. Jakarta: Director General of Higher Education.
[3] Jamaris. (2003). *Development and Development of Din Ages*i. Jakarta: Early Childhood Education Study Program PPS UNJ.
[4] Sujiono, Ahmad. (2009). *Cognitive Development Method*. Jakarta: Open University.
[5] Mutiah, Diana. (2010). Psychology of *Playing Early Childhood*. Jakarta: Kencana.
[6] Montolalu. (2008). *Play and Play Children*. Jakarta: Open University.
[7] Suyanto, Slamet. (2005). *Basic Concept of Early Childhood Education*. Jakarta: Director General of Higher Education.
[8] Arikunto, Suharsimi, et al. 2012 Classroom Action Research. Jakarta: Literacy