



The Effect Of experimental Methods On Cognitive Capabilities Of Science Concept Education in Early Children Education in the Playground Playing FKIP Unpatti Ambon

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Article Info

Article History:

Received: March 27, 2020

Revised: April 11, 2020

Published: April 30, 2020

e-ISSN: 2623-2324

p-ISSN: 2654-2528

DOI: 10.5281/zenodo.3813333

Abstract:

This study aims to (1) Determine cognitive abilities in early childhood science concepts before being taught with the experimental method of KB Mawar FKIP UNPATTI (2) Knowing cognitive abilities in early childhood science concepts after being taught with the experimental method in KB Mawar FKIP Unpatti Ambon (3) Testing the significant difference in influence between before and after the use of experimental methods on cognitive abilities of early childhood science concepts in KB Mawar FKIP Ambon Ambon. This research was conducted at KB Mawar FKIP Unpatti Ambon. The method used is a quasi-experimental design with *one group pretest-posttes*. The population of this research was all students of KB Mawar FKIP Unpatti Ambon who were 6 years old. Sampling of this study was carried out using proportional random sampling technique which was carried out randomly in 1 class that is 10 people. Data was collected through an instrument of observation of the cognitive abilities of scientific concepts. The reliability of achievement motivation instruments is 0.89, the learning achievement test is 0.87. Data from the results of this study were processed using the t test analysis technique for independent samples at a significance level $\alpha = 0.0$.

Keywords: Experimental Method, Cognitive Ability, Science Concepts

INTRODUCTION

The implementation of early childhood education focuses on growth and development both physically motoric, cognitive, social emotional language and spiritual (moral). How to provide early childhood stimulation is to provide or create activities that cover various aspects of child development by providing various facilities and media needed by early childhood according to their needs. Similarly, for the improvement of children's cognitive abilities. Individuals think using their minds, cognitive behaviors that involve cognitive abilities in the

concept of initial arithmetic becomes easy to understand as a basis for future mathematics learning. The basic concept of science is to recognize the concept of numbers in group B in the Kindergarten education unit. Efforts to help physical and spiritual growth and development so that children have readiness to enter further education it is necessary to introduce the "*Experiments of science*" that is the study of basic scientific facts in everyday life. The fundamental purpose of science is to develop literate individuals towards the scope of science itself, and be able to use its fundamental aspects in solving the problems it faces.

Early childhood can be introduced to nature, play through learning and care for the real environment. Children will learn experiments to explore and investigate the surrounding environment, so as to be able to build an attitude, a deep impression that will be carried and used in adulthood. In practice in early childhood basic education in the city of Ambon, development is still needed through innovative methods. The experimental method and the demonstration method are the methods used while playing in kindergarten, which are rarely applied because of incomplete playing facilities and monotonous teaching systems and the lack of teacher creativity in introducing and utilizing existing learning resources. Thus it is necessary to conduct research on the effect of the experimental method on cognitive abilities of young children in KB Mawar FKIP Unpatti Ambon. The reasons for the selection of this title are: (1) PAUD children have the ability to solve the problems they face through the use of experimental methods so that children are skilled in solving various things that they face. (2) Children get scientific knowledge and information that is better and can be trusted, meaning information obtained by children is based on proper scientific standards, because the information presented is the result of findings and formulations that are objective and in accordance with scientific rules that shelter them. (3) PAUD children are more interested and interested in experiencing activities carried out through the experimental method carried out in the surrounding environment.

According to Whiterington (1979) in Buchori (1985), play has the function of facilitating the development of children's cognition and allowing children to see the environment, learn something and solve problems they face. Besides that playing can also improve children's development in social, linguistic, motor physical aspects and the development of children's moral values.

Many benefits can be obtained if children from an early age have been introduced to a variety of knowledge so that the learning methods carried out by the teacher are expected to simulate the child so that the knowledge obtained can develop as expected. Experimentation methods and demonstration methods can have an effect because children are given the opportunity to discover for themselves what the teacher provides in accordance with the learning steps and material provided in play activities, accustom children to follow the stages of experimentation and demonstration, train children to be careful because children must observe, make predictions and make decisions.

Based on observations on January 10, 2019 conducted at the FKIP Unpatti Rose Play Group as an PAUD Laboratory on the use of the Experimental Method, several problems were encountered: (1) most of the students' development was below standard with mastery learning reaching two stars or just starting to develop which is expected to be a child said to develop is to reach four stars or develop very well, (2) The method used is a method of play that only involves children playing without the teacher paying attention to the child's cognitive development, (3) Not being able to foster a pleasant learning atmosphere in the sense that most students have not active in the learning process in class. This is reinforced by Whiterington (1979) in Buchori (1985) play has the function of facilitating the development of children's cognition and allows children to see the environment and can solve problems faced.

Related to the above problems, it is necessary to try and implement innovative learning methods in order to help the teacher to develop children's scientific abilities in thinking and

skilled in solving problems, making experiments and demonstrating activities according to the teacher's instructions in the classroom and outside the classroom. Starting from the background of the problem above, the research problem can be formulated as follows: (1) How are cognitive abilities in early childhood science concepts before being taught with the experimental method in KB Mawar FKIP Unpatti Ambon ?, (2) How are cognitive abilities in children's science concepts early age after being taught with the experimental method in KB Mawar FKIP Unpatti Ambon ?, (3) Is there a difference in the effect of the use of experimental methods on cognitive development of early childhood science concepts in KB Mawar FKIP Unpatti Ambon? with the aim of: (1) Knowing cognitive abilities in early childhood science concepts before being taught with the experimental method in KB Mawar FKIP Unpatti Ambon, (2) Knowing cognitive abilities in early childhood science concepts after being taught with experimental methods in KB Mawar FKIP Unpatti Ambon , (3) Test the significant difference in influence before and after the use of experimental methods on cognitive abilities of early childhood science concepts in KB Mawar FKIP Unpatti Ambon

The Cognitive Understanding Theory

Cognitive is one aspect of human development related to knowledge, namely all psychological processes related to how individuals learn and think about their environment (Desmita, 2012). This is in line with the opinion of Myers (in Desmita, 2012) that cognitive is all mental activities associated with thinking, knowledge and memory. This was also stated by the Web (in Holis, 2016) that cognitive is a process of knowing.

Piaget (in Mukhlisah, 2015), cognitive is how children adapt and interpret objects and events around them. Kwartolo (2007) also explains that human cognitive is determined from within human beings themselves. Vygostky (in Moeslichateon, 2004) cognitive is the ability to pay attention, observe, remember and reasoning that involves learning using community findings such as language, mathematical systems and memory tools. This is in accordance with Kwartolo (2007) which states that humans not only develop in the biological social sense, but psychological functions such as perception, attention, memory that continue to increase from birth. This is because humans are transformed in social and educational contexts through language, means, and culture, human social laws continue to develop until they reach a higher level of cognitive psychology.

Based on some of the statements above, it can be concluded that cognitive is a mental activity related to perception, attention, memory, language, culture and information processing that are interrelated with knowledge, memory and thought processes as well as all psychological processes related to learning, paying attention, observing, imagine, judge and think about the environment.

Basic Concepts of Science PAUD

Science is an object of discussion that deals with the field of study of reality or facts and is accompanied by theories that explain natural phenomena. There are several divisions of branches in science namely Biology, Physics, Chemistry and Earth Sciences.

Each branch is divided into several more specific sections. Zoology and botany are part of the branch of biology. The scope of the science learning program will be developed into three basic substances namely education and science learning containing programs that facilitate the mastery of the science process, the mastery of science products and programs that include the development of scientific attitudes.

The introduction, understanding and love of science must start early, if we want our generation to be no less competitive with young people abroad. Every child can benefit from various scientific events and try to analyze them, such as collecting various kinds of leaves, rocks, shells, catching boolas, reading about types of animals and so on. As educators, we must first understand and realize science as a very useful and exclusive activity (only belonging to scientists).

One of the basic skills development in PAUD is cognitive ability. Cognitive abilities are needed by children to develop knowledge about what is seen, heard, felt, touched and smelled through their five senses. Cognitive is a thought process where individuals have the ability to connect, judge and consider an event or event (Sujiono, 2010). The experimental method is one of the appropriate learning methods for learning science. In everyday activities, children will be dealing with the world of science starting from simple to those that require complex thinking.

Science is a part of our lives, and our lives are an important part of learning science. One of the main characteristics of learning science in early childhood is the interaction between children and the environment, this is because science education is the same as other education which has an important role in shaping the personality and intellectual of children.

Children must be given the opportunity to be in direct contact with the object to be or is being learned. With learning activities like this the child is learning about what is called science. Children are guided to search for problems, look for various explanations about the phenomena and events they see, develop physical motorics and practice using their reasoning to solve and find solutions to problems encountered by conducting relevant experiments.

Science for early childhood has a component that is science is a product, and science as a process. As a product, science is a well-organized body of knowledge about natural physics. As a process, science involves experimenting, tracking and observing. This is very important, because children can participate in the scientific process so that the skills they get will be taken to other developments and be beneficial to children's lives.

Through science learning can train the ability to think. If the child's thinking ability develops; then the child can process the acquisition of his learning, find various kinds of alternative problem solving and develop mathematical logic skills. In addition, children also have the ability to be able to sort out, classify and prepare for the development of thinking skills. This is in accordance with the opinion of Wahid & Suyanto (2015) that introducing science from an early age means helping children to start thinking critically and logically. Science helps children experiment, explore, and observe the surrounding environment. This is slowly able to build children's character to get used to thinking scientifically, trained to solve problems, and have high analysis.

According to Yulianti (2010), there are several types of science skills that can be trained in early childhood. *First*, observing the child is invited to observe the phenomenon or natural events that occur in the environment around the child itself, starting from the simplest things. *Second*, classifying the child is asked to classify objects according to their categories. *Third*, estimating namely the child is asked to predict what will happen. *Fourth*, counting namely the child is encouraged to count the objects that are around then introduce the forms of objects to the child.

Based on some of these things, there are several scientific concepts that children can learn, including recognizing surrounding objects according to size (measurements), objects put in water (floating or sinking), trying and distinguishing various kinds of taste, smell and sound; color mixing and plant growth process.

Piaget (in Gunarti, Suryani and Muis, 2008) In providing science learning to young children, especially the provision of science and mathematics must be concrete (real) and active. Concrete thinking is realistic thinking according to the knowledge received by the five senses. Being active means investigating problems and placing them in possible solutions, looking for cause-effect relationships, recording results from various experiments and being able to make generalizations.

Experimental Method

Understanding the Experimental Method

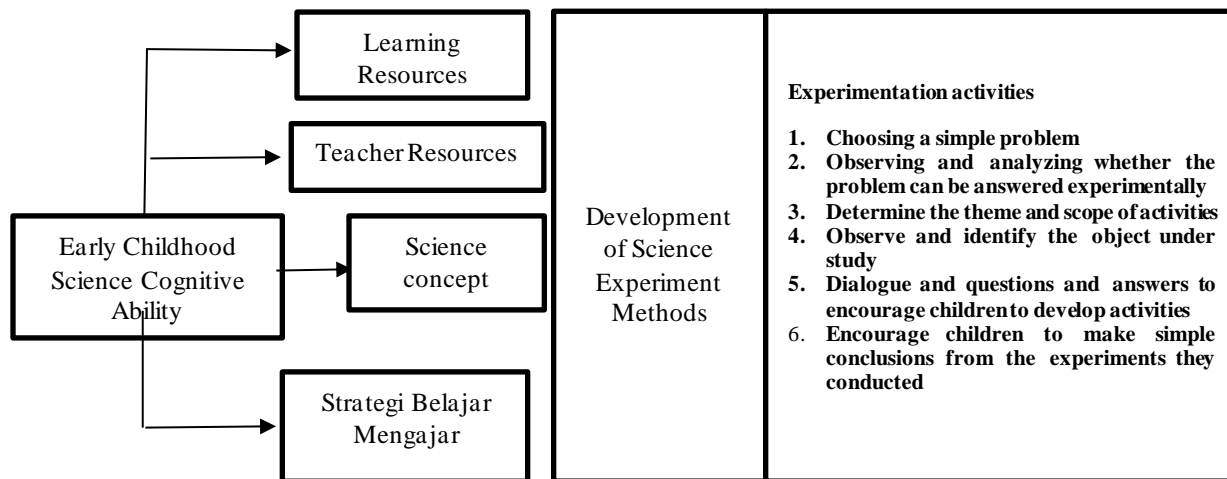
Enggen (2012), defines the method of expression as a way of presenting subject matter in which the child actively experiences and proves himself about what he is learning. Through this method, children are totally involved in doing themselves, following a process, following an object, analyzing, proving and drawing their own conclusions about an object, situation or process.

Djamarah (2000) suggests that the experimental method is a method of providing opportunities to individual or group early childhood, with the aim of being trained to carry out a process and an experiment. It was also added by Winataputra (2005) that the experimental method is a teaching method in the presentation or addition of material through the results of experiments or individuals trying something accompanied by the process of observing the process.

Nugroho (2008) describes the experimental method as a method which provides an opportunity for children to practice conducting direct evidence by conducting experiments, observing the experimental process and finding conclusions about events in the research process. With the experiment the child will not simply take the amount of information obtained, but try to manage its acquisition by comparing the stages of facts obtained in the experiments conducted.

Based on the descriptions above, it can be concluded that the experimental method is a method or method of presentation in which the child actively explores, seeks and discovers what he is learning. This is obtained through the process of experimentation and observing what the individual does, to compare the stages of the facts he obtained.

Figure 1. Research Roadmap



This method

Research uses a quasi-experimental research design, with a design model *One group pretest-posttest* (Wiersma, 1995: 139, Tuckman 1999). This quasi-experimental research design uses one class. So quasi-experimental research uses all subjects in the study group for before and after being given treatment (*treatment*), and not using subjects taken at random. Thus the design used in this study is *One Group Pretest-Posttest Design*.

The subjects in this study were PAUD Mawar FKIP Unpatti were KB Mawar FKIP Unpatti students in the 5-6 years age group totaling 10 people who were used as the experimental class. While this research variable consists of: one (*independent*

variable independent variable), one (dependent variable dependent variable), one moderator variable. The independent variable in this study is the experimental method. The dependent variable observed as a result of the influence of the independent variable is cognitive ability. Cognitive abilities in this study are scientific abilities that can be seen from observations.

The instrument used in order to solve the problem to be studied or achieve research objectives, in the form of assessment or observation guidelines that were previously tested given the purpose of this study, which is to reveal the differences in the average ability of early childhood science, then the data analysis technique used is an inferential analysis using the t test. To obtain accurate data, all instruments used were tested on similar schools that had the same character. The results of the trial of the instrument showed that the reliability and validity coefficient of the scientific ability assessment guidelines were 0.89 and 0.87. For the purposes of analyzing the research data two types of analysis techniques are used, namely: (1) Descriptive analysis, and (2) Inferential analysis.

RESULTS AND DISCUSSION

Descriptive analysis results about the cognitive ability score of science concepts before being taught using the experimental method range of theoretical scores of 10 - 40 and obtained an argument score range with the lowest score of 24 and the highest score of 38 obtained an average price of 30.4 with a median of 30, 5 and a mode of 31, where the distribution of science ability scores before using the experimental method is that most of the early childhood ie 3 people (30%) have cognitive abilities of science concepts at a score of 30 - 32 or are at an average value and above average , while almost a part of it is above the average score of 30 - 32. From these results it shows that the frequency distribution of cognitive abilities in the science of treatment concepts is categorized as good.

Based on data from the results of the research, the Science Cognitive Ability score in the group after using the experimental method ranges the theoretical score of 10 - 40 and obtained the range of argument scores with the lowest score of 28 and the highest score of 40 obtained an average price of 35.4 with a Median of 35.5 and Mode 35, where the distribution of ability scores is between 34 - 36: 3 people (30%) who get above the average of 7 people (70%) and who score below the average of 3 people (30%). From these results it shows that the frequency distribution of Cognitive Ability of Science Concepts in early childhood after being taught by the experimental method is included in both categories.

The results of inferential data analysis as stated in chapter III, that the analysis used in hypothesis testing is the t test analysis if the data of both groups are normally distributed and homogeneous. For this reason it is necessary to conduct a data normality test with Liliefors analysis techniques and Homogeneity test with a Barlett test. (Ruseffendi, 1998: 291-297). For normality test using liliefors analysis technique, the value of L_0 is smaller than L_1 i.e. the group after the experiment $0.1210 < 0.258$ and the group before the experiment amounted to $0.1398 < 0.258$ thus concluded that the group data in the experimental group and the group before the treatment were normally distributed. Homogeneity testing is done by the Barlett test (Ruseffendi, 1998: 297). This requirement is pleased with the similarity of variance between group data in the group before and after group. Based on the test results for both groups of data in the experimental group and the group before it turned out to be "homogeneous" because obtaining the results of χ^2 count was smaller than χ^2 table that is $0.02 < 3.84$.

Results of testing the hypothesis "There is an average difference Cognitive Ability Concepts Science early childhood before and after taught and after taught using an experimental method with the formulation of statistical hypothesis: $H_0: \mu_1 = \mu_2$, $H_1: \mu_1 > \mu_2$ Analysis of the difference between Cognitive Ability concepts Science early childhood in groups after given treatment / experiment (X_1), with Cognitive ability concepts Science early childhood prior to treatment / experiment (X_2), using an analysis t test for independent samples from two groups of the same to know whether the research hypothesis can be accepted

or rejected. From the calculation results obtained $t_{\text{count}} = 2.78$ while t_{tables} with degrees of freedom $n - 2 = 8$ at the significance level $\alpha = 0.05$ obtained 1, 73 then $t_{\text{arithmetic}} > t_{\text{table}}$, this means that the difference in both means is significant at level 0, 05. Thus it can be concluded that there are differences in the average cognitive abilities of early childhood science concepts before and after they are taught using the experimental method. This proves that the influence of the experimental method on the development of cognitive abilities of early childhood science concepts so that the use of this method is highly recommended for educators so that in planning and implementing the learning process can use and apply experimental methods to develop various aspects of development. The use of the experimental method implies that in its use as a method always gives children the opportunity to practice conducting direct evidence by conducting experiments, observing the experiment process and finding conclusions about the events in the research process, the cognitive abilities of science concepts because science is part of our lives, and our lives an important part of science learning. One of the main characteristics of learning science in early childhood is the interaction between children and the environment, this is because science education is the same as other education which has an important role in shaping the personality and intellectual of children. Thus in addition to developing cognitive abilities the concept of science in this case refers to aspects of cognitive development and developing the ability to recognize the environment around the child must be given the opportunity to be in direct contact with the object to be or is being studied. Learning activities like these children are learning about what is called science. Children are guided to search for problems, look for various explanations about the phenomena and events they see, develop physical motorics and practice using their reasoning to solve and find solutions to problems encountered by conducting relevant experiments.

Science for early childhood has a component that is science is a product, and science as a process. As a product, science is a well-organized body of knowledge about natural physics. As a process, science involves experimenting, tracking and observing. This is very important, because children can participate in the scientific process so that the skills they get will be taken to other developments and be beneficial to children's lives. Through science learning can train the ability to think, if the child's thinking ability develops; then the child can process the acquisition of his learning, find various kinds of alternative problem solving and develop mathematical logic skills. In addition, children also have the ability to be able to sort out, classify and prepare for the development of thinking skills. This is in accordance with the opinion of Wahid & Suyanto (2015) that introducing science from an early age means helping children to start thinking critically and logically. Science helps children experiment, explore, and observe the surrounding environment. This is slowly able to build children's character to get used to thinking scientifically, trained to solve problems, and have high analysis. Especially for educators who have new experience to improve professionalism in developing various materials and activities programs in PAUD institutions and are able to carry out their duties and responsibilities as PAUD educators who are professional.

Based on the explanation above, it can be concluded that there are significant differences in the average cognitive ability of science concepts between the group before and after the group through the use of experimental methods. This is because these activities are in accordance with the principles of learning for young children, which contain elements that are well known to children, simple, learning while playing, using sensory, and learning while doing. Insoluble and insoluble material experimentation activities are simple material for children, and involve children directly to explore with concrete objects. In accordance with the statement of Sofia Hartati (2005: 30) that the principle of learning for early childhood must be fulfilled in order to achieve optimal developmental stages. Supported by Piaget (Slamet Suyanto, 2005: 128) explains that children are in the pre-operational phase, where learning through concrete objects will be better and more meaningful.

The enthusiasm of children directly involved in conducting experiments shows that by being directly involved, children's motivation increases and can measure children's science process skills. Previous research conducted by Nurmaleni (2014) and Djamarah (2000) suggested that the experimental method is a method of providing opportunities for individual children or groups, with the aim of being trained to carry out a process and an experiment. It was also added by Winataputra (2005) that the experimental method is a teaching method in the presentation or addition of material through the results of experiments or individuals try something accompanied by a process of observing the process, it can be concluded that the experimental method is a method or method of presentation where children actively explore, looking for and discovering for themselves what he learned, this is obtained through a process of experimentation and observing what individuals do, to compare the stages of facts they obtain.

From the explanation of the results of the research that has been described it is known that the teacher has a role in helping children develop scientific concepts through the experimental method and the demonstration method. The teacher's role is to help children find knowledge through experimental activities and demonstrations by giving explanations, information, and questions. With the explanation, information, and questions provided by the teacher can guide children to find answers in their own way. Ali Nugraha (2008: 136-137) explained that in learning science teachers have roles, including as an initiator, facilitator, observer, elaborator, and motivator.

The researcher also found that in carrying out group activities children interact with group friends, express ideas, conduct discussions, and help friends in difficult groups. Explained by the opinion of Vygotsky (Slamet Suyanto, 2005: 128) that when playing children usually express ideas in words, ask themselves, and answer their own questions or *internal speech*. In developing the science skills of children's interactions with adults and peers affect the way children think. So in developing science skills for early childhood, the application of cooperative learning that enables brainstorming is highly recommended. Another thing that affects the ability of science is the experience that is brought or already owned by children.

Thus the cognitive ability of science concepts in children aged 5-6 years in KB Mawar FKIP Unpatti Ambon is influenced by internal and external factors. Internal factors are factors that originate from within the child, namely the child's cognitive abilities. Cognitive abilities in this study include the ability to solve problems and the ability to think logically. While external factors are factors that originate from outside the child's self include, the implementation of learning, the role of teachers and peers, as well as the child's previous experience. Therefore, the development of the cognitive abilities of scientific concepts by showing exploratory and probing activities, showing creative attitudes in solving problems, arranging plans for activities to be carried out and recognizing cause-and-effect about the environment that should be done through experimental and demonstration methods in groups using concrete objects, and the teacher acts as a facilitator who provides information and direction. However, this research has limited scope which only discusses the concept of science in soluble and insoluble experimental activities using demonstration and experimental methods. This indicates that there is a need for further research on different themes and topics to further elaborate on the concept of science.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Overall early childhood who learn the concepts of science using the experimental method has a very good influence on developing children. In more detail, children in the experimental group namely in KB Mawar have the cognitive ability of scientific concepts using the experimental method showing exploratory and probing activities, showing creative

attitudes in solving problems, planning of activities to be carried out, and recognizing cause and effect on their highly developed environment. Good

There are differences in the average cognitive ability of science concepts of children aged 5-6 years between students before being taught with the experimental method and students after being taught by the experimental method. It can be concluded that there are differences in the average cognitive abilities of early childhood science concepts in the experimental and control groups. Thus it can be concluded that there is an influence of the experimental method on the cognitive ability of science concepts of children aged 5-6 years at KB Mawar FKIP Unpatti Ambon

Suggestion

The results of this study are expected to be input for teachers in carrying out learning by using experimental methods with concrete objects to develop cognitive abilities of scientific concepts, becoming a facilitator for children in the learning process to help children discover new knowledge and apperception to link the knowledge that children already have with knowledge that will be studied.

The results of this study are expected to be input for School Principals to provide encouragement and opportunities for teachers to develop various methods / models / strategies by using APE of natural materials to improve the cognitive abilities of science concepts for all early childhood.

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