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THE IMPACT OF EXPERIMENTAL SCIENCE METHOD TOWARD CHILDREN DEVELOPMENT: CASE STUDY OF GROUP 'B' STUDENT OF THE YAPITA KINDERGARTEN SURABAYA

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Abstract

The present study aims to examine the impact of experimental science method toward children development of group B student of Yapita Kindergarten Surabaya. The present research uses experimental research using a quantitative approach. This study is using the Nonequivalent Control Design type of Quasi Experimental, where there are two groups, which are 'the experimental group' and 'the control group'. The implementation pattern in this study uses Nonequivalent Group Design. The research sample was divided into two groups: the experimental group and the control group in which these groups have the same characteristics or almost the same. 'The experimental group' was treated with the experimental method treatment, while the 'control group' was treated with conventional learning treatment. The data is obtained from the observation sheet. The grid used was the Child Development Achievement Level (Tingkat Pencapaian Perkembangan Anak), in accordance with the cognitive development level of the Group-B students. The average score of the science development experimental group before the initial observation is 1.61, could be rounded to 2, which means that the children capabilities in mastering the numerical concept are in the 'starts to develop' category. The average score of the final observation in the experimental group is 3.67, can be rounded to 4, which means that the average children in the science development are in the 'developing very well' category. In the experimental group, the average is increased by 2.06.

Keywords: ***Experimental Science Method, Quantitative Approach, Control Group, Experimental Group.***

Introduction

Early childhood is experiencing a sensitive period in which during this period the nerve nodes inside early childhood period brain are busy to construct knowledge by assimilating and accommodating stimuli which are obtained through the environmental observation. Therefore, children in this period are commonly curious and thought all events they see. (Hasan, 2012: 29).

There are various learning method options that are suitable for early childhood for instance constructive-based learning. This method provides children with various kinds of activities. Moreover, this method is known as one of the most appropriate alternatives to introduce the children to the nature or better known as science activity. "Science activity is one of the essential content areas in early childhood education" (Izmir, 2011: 161) "They also build essential science process skills as observers classifying and sorting" (Eshach & fried, 2005; Platz, 2004). Furthermore, this method can be used as an alternative to introduce sustainable development coupled with language learning process toward early childhood (Arumsari, et al., 2017).

Science is a knowledge that examines, explains and invests natural phenomena with all their empirical aspects (Putra, 2014: 51). Science is a process and product / knowledge which include the introduction of facts, concepts, theories and principles of law (Sovia, 2015: 101). So it can be concluded that based on the various scientific definitions stated by some of the above experts (Sond and Towribge, 2008; Putra, 2014; Sovia, 2015) it can be concluded that the definition of science is a process and product (knowledge) related to nature.

Based on information mentioned above, it can be concluded that science is a method for gaining knowledge. It is series of processes carried out in science activities called the scientific method. Furthermore, science can be regarded as a product consists of various facts, concepts, principles, laws and theories. Third, science as an attitude is the values that must be possessed by a scientist. These attitudes include high responsibility,

curiosity, discipline, diligence, honesty and openness.

Within early childhood education, according to Carson (in Nugraha, 2002: 13) science for children is something amazing, found and considered attractive, and gives knowledge or stimulates early children to know and investigate more about their surrounding.

Based on the observations that have been made by numerous scholars Indonesia, it is found that children have limitation concerning their imagination about events or facts in their daily activities, therefore scientific ideas have not yet appeared for children. For instance, most of Indonesian children interpreted rainwater as crying sky because of grief. It happens because in their daily activities, Indonesian children are more focused on learning mathematic and *calistung* reading, writing, arithmetic (*calistung).* In other words, their ability to explore nature and their interest in nature or commonly known as 'children's naturalistic intelligence' has not been trained. Early childhood characteristics are imaginal reasoning, but something that their logical reasoning are still according to their imagination reasoning which close to magical. But in fact, children imagination reasoning should be explained scientifically since it will lead children to use their logical reasoning in order to stimulate their sensitivity and interest toward all events that happen in their daily activities nearby their environment.

Scientific learning for early childhood in Indonesia is deliberated in less appropriate method since children are more introduced with supporting books and memorisation rather than close to numerous events that encourage children to be involved with nature. The outcomes of scientific learning cannot be achieved only with rote methods, since events and natural phenomenas are unclear or abstract for the children. It can be achieved easily when children learn from the object of event or phenomena directly.

Regulation of the Ministry of Education and Culture (*Permendikbud*) number 146 of 2014 regarding the 2013 curriculum for early childhood education, states that the core activities of learning activities are carried out with a scientific approach, which includes observing, asking questions, gathering information, reasoning and communicating. This regulation in accordance with scholars opinion which mentioned that “A sign which indicates that the kindergarten children have not acquired learning outcomes when they cannot think critically, logically and systematically. Developing scientific thinking from an early age will facilitate the transfer of scientific skills that have become academic areas, which can support academic achievement” (Kuhn and Pearsall, 2000; Kuhn, Schauble).

Although the natural environment will attract and able to encourage children to lean but still it must be supported by a conducive environment which enable children to develop. "Although children are affected by other factors in their learning process, the role of the teacher can be considered as the most important factors" (Wylie and Thompson, 2003).

The experimental method is very appropriate for the development of early childhood science, because by experimenting, the child will go through the process, not just fixated on the results alone. This is in line with the opinion of Suyanto (2005: 83), which states that the introduction of science to kindergarten children must be emphasised more on the process rather than the product. The scientific process is known as the scientific method, which broadly includes: (1) observation, (2) finding problems, (3) conducting experiments, (4) analysing data, (5) drawing conclusions.

The application of learning using experimental methods is in accordance with the character of early childhood period who have the passion for exploring the environment around the child. Piaget (in Catron and Allen, 1999: 7-8) believes that children build their knowledge through interaction with the environment.
Children are not passive recipients of knowledge, children actively organise their experiences into complex mental structures. This is in line with the theory of maturation (maturity) first put forward by Hall, Rosseou and Gesell (in Catron and Allen, 1999: 6), where all three of them believe that children should be given the opportunity to develop.

Montesori (in Morrison, 2011: 11) reveals that with experimental learning methods, the involvement of the senses in large portions is undoubted, thus facilitating the learning process.
The cognitive process of scientific development, which is carried out in the experimental method: shows cause and effect, shows exploration creativity, and investigates, so that in the end the child will be able to understand facts, theoretical concepts, and laws, all of which are the products of science. Furthermore, selection of scientific learning object / content such as objects around children, objects that take the child's attention, all events in the surrounding environment that interest them are essential to develop their scientific ability since children have natural tendency to observe and think about nature (Eschach & Fried, 2005; Ramey-Gassert, 1997).

The selection of learning object / content of science also in-lines with Montesori in Sudono (2006: 03), which argues that the environment or the natural environment is something that invite children to like their learning process. For example: water, air, fire, soil, plants and other natural phenomena such as rain, lightning, clouds of fog etc.

Based on the explanation above, it can be concluded that scientific learning can be introduced to early

childhood, but introducing science to children must be in proper approach in order to encourage children to observe the events directly. The introduction of science from an early age will foster children's interest in natural phenomena, so that it will stimulate early childhood naturalistic intelligence.

Research methods

The present study uses experimental research by utilising quantitative approach. This study is using the Nonequivalent Control Design type of Quasi Experimental, where there are two groups, which are 'the experimental group' and 'the control group'. The implementation pattern in this study uses Nonequivalent Group Design.

In the implementation of this experimental study, researchers divided the two groups, the experimental group and the control group, both groups have the same properties and characteristics, or nearly the same. The division of the two groups aims to compare the improvement of scientific development in the experimental group given treatment using the experimental method, while the control group uses the usual conventional learning method.

In the experimental group, given the treatment using the experimental method 1 time per week for 5 weeks. The activity using the experimental method was carried out for 60 minutes during school hours with the same topic, with the theme of learning "water". While the control group follows routine learning, according to what is scheduled by the teacher. In this study, sampling results were taken by sampling technique, namely no-probability sampling, and for more specific results researchers use purposive samples.

The reason why the researcher determines the location and subject of the research are as follows:

1) The research subject is Yapita Kindergarten children in group B, has the same homogeneous characteristics and characteristics (based on the stage of development of children aged 5-6 years), including background, place of residence, socioeconomic status, customs, and ability level and potential the same one.
2) Previous research on the experimental method at Yapita Kindergarten Surabaya has never been done.

Data collection techniques are needed so that activities in the research become systematic and easier. In this study, data collection techniques use observation and documentation techniques.

This study uses structured observation that is systematically designed systematically about what will be observed, when and where it is (Sugiyono, 2014: 205).

Observation instruments for data collection were carried out before and after the study. The grids used were the Child Development Achievement Level (*Tingkat Pencapaian dan Perkembangan Anak*), Developmental Achievement (*Capaian Perkembangan*) and all indicators that corresponded to the cognitive level of the children in Group-B.

Research Results and Discussion

The results of the experimental method can be seen from the difference in acquisition of 'stars', which shows the development of science in the experimental and control groups. Mastery of the number concept in this study consists of five statement items or indicators. The development of children's science can be seen from the average acquisition of 'stars' in the group of children who participated in the observation activity. Observation activities aim to collect the development of scientific data were carried out twice, they are the initial observations and final observations activity. The acquisition of each 'star' per child can be seen on the table below. The results the 'water' experiment method can be seen through a comparison table of group averages, on the scientific development variables, at the time of initial observation and final observation in the experimental and control groups, as follows:

Table 1. Comparison Table of Star Earnings in Initial and Final Observations of Experimental Development Groups and Control Groups

	Initial observation	**Final observation**	**increase**
Control group	**1,73**	**2,40**	**0,67**
Experimental group	**1,61**	**3,67**	**2,06**

From the table 1 above, a comparison graph of the 'stars' acquisition average can be presented. Variables in child science development, initial observation and final observation of the experimental and control groups are:

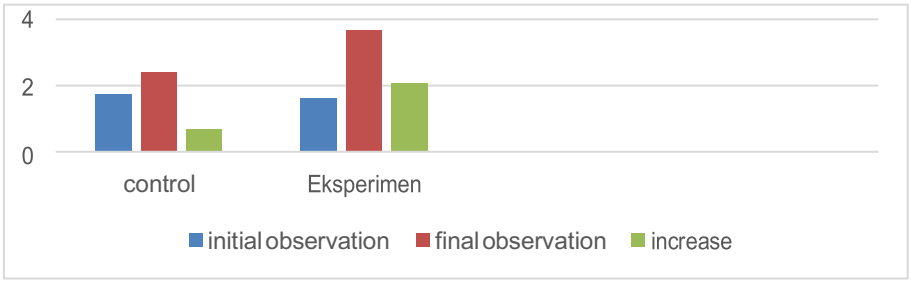

Figure 1. Comparison Graph of the 'Stars' Acquisition average of Initial Observation and Final Observations of the Experiments Group and the Control Groups

Based on the graph above, it can be concluded that the average value of the scientific development control group in the initial observation is 1.73 (can be rounded to 2), which means that children in the development of science on average are in the category of 'begin to develop'. The average value of the scientific development control group in the final observation is 2.40 (can be rounded to 2), which means children in mastering the numerical concept, on the average are in the category of 'begin to develop'. In the control group the average is increased by 0.67.

Conclusions and recommendations

The conclusion of the study of the experimental method effects of science development on the Group-B children of Yapita Kindergarten Surabaya is a method that significantly influences the development of children. The average value of the experimental group in the development of science on the initial observation is 1.61 (can be rounded to 2), which means that the children in mastering the numerical concept, on average are in the category of 'begin to develop'. In the final observation, the average value in the experimental group is 3.67 (can be rounded to 4), which means that the children in the science development on the average are in the category of 'very well developed'. In the experimental group, the average value is increased by 2.06.

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