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Developing Science Skills Right from Childhood through Games

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Abstract : Scientific activities conducted at the level of early childhood education (PAUD) in general are still in the form of activities to memorize concepts, making science become a less meaningful activity. To improve this situation there should be integrate aspects of early childhood development and child characteristics regarding science skills. A child is still under the age of playing and happy to explore the surrounding environment, it is therefore a good learning moment. This playing indulgence can be used as a means to develop a science skills. Science process skills that can be developed in early childhood include observing process skills and classifying which includes the basic process skills . The objective of this study is to describe the process of observing skill and classifying the skills in early childhood activities using games with an animal theme. The study conducted using a qualitative method that involved as many as 11 research subjects in early childhood Laboratory of Universitas Pendidikan Indonesia, branch campus in Cibiru. Data of the study were collected using assessment sheet, namely rating scale. To strengthen the skills data from the assessment process, video recordings and field notes were also used. The results showed that the process ability of science to observe and classifying a growing child is useful.

Keywords : Science process skills, method and games.

1. INTRODUCTION

Learning activities for early childhood should involve aspects corresponding with the characteristics of early childhood age ranging from 2 to 9 years (Harmer, 2007), including by taking into account the needs of children to play. Likewise, the area of Science, the children know the science through the game in order to develop a science process skills.

Science process skills is a motor skills, cognitive and social mental that help children performing scientific investigations in discovering and developing scientific knowledge and apply it in life. Science process skills are divided into two, namely basic science process skills and integrated. Integrated science process skills can be mastered if the child has mastered the skill aspects of basic processes (Esler and Esler, 1996: 81). In this study, aspects of the science process skills developed is the skill to observe and classify. Science process skills are included in the basic science process skills that can be developed in children aged 4 to 9 years (Bundu, 2006: 49).

This study used method of games that generally include two types, namely *settling games* and *stirring games.* In settling games, the game is done without involving hard motor activities, while the execution of *stirring games*, children are expected to move physically active (*Total Physical Response*).

Studied science process skills are the skills to observe and classify. Both types of process skills appropriate to be developed at an early age, because basically children are happy to observe their surroundings. Through observing activities, furthermore the child is able to distinguish the characteristics of an object or a natural occurrence in which subsequently to be classified by the differences as well as similarities of the objects characters.

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Science process skill is not a skill acquired simultaneously, but through a continuous process. Therefore, the basic process skill such as observing and classifying should begin to be developed as early as possible so that it can be used by children as a foothold to gain a more complex process in higher education.

The theme presented during the research process was Animals, which was divided into sub-themes, 1) Body Parts and Body Closures, 2). Animal sounds, 3),. Animal Motion, 4). Animal Food, and 5). Animal habitats. Animals were used as the main theme because it is a kind of natural objects which is vary greatly that it is very appropriate to be explored chosen as the theme for developing science process skills of observing and classifying.

Froebel (in Johnston, 2005: 5), Harlen *et. al* (2003 : 55-56), and Depdiknas (2004: 6) stated that early childhood growth and development through playing activities or *action*.

The concept of learning while playing for early childhood will be very valuable and enjoyable if children are given the opportunity to explore, investigate / find, create, practice, repeat / review, and consolidate the development of skills, knowledge / understanding, as well as attitude. Playing gives children the opportunity to interact with various objects, friends, and adults in a fun way.

Bundu (2006: 12) states that :" The process of science is a certain amount of skill to study natural phenomena in certain ways to acquire further knowledge and science development. While the science process skills according to Pekmez, Tasar, Temiz, and Tan (Aktamis, and Yenice, 2010 :3282) are skills that help students in learning science, determines ways to investigate and scientific discovery, improve the persistence of learning, activate students, increasing the sense of responsibility, as well as to help students understand how science is applied in life. On the other hand, Settlage and Southherland (2007: 56) defines the science process skills as essential activities undertaken in the work of scientific inquiry.

Curriculum developed in PAUD should include the development of science process skills on an ongoing basis in science activities. Suyanto (2005: 158) reveals that the introduction of science in kindergarten children made to develop the ability of :1). Exploration and investigation, namely activities to observe and investigate objects or natural phenomena; 2) develop the basic science process skills (observe, measure, classify, communicate observation results, and conclude); 3) develop curiosity, pleasure, and interest to perform inquiry or discovery activities; and 4) understand the knowledge of various objects (characteristics, structure, and function).

Characteristics of children who like to play can be used as a support in developing science process skills. The child can repeat a game that has been known to test their ideas or skills. However, teachers need to be concerned ao that the media or device used do not make the children bored. Teachers may use the same game but with new game media or tools so that it would be more interesting to play, or use a media and a toy that has been known in a game but with different way (Harlen *et. al,* 2003:63).

Skill to observe is not only consisting of activities that use the senses of sight, but include 1) the use of all senses precisely to observe objects; 2) to identify the similarities and differences between various objects carefully; 3) observe patterns in a series of objects or natural phenomena; 4) identify the sequence and events that occur in nature or phenomena that appears; 5) interpreting observation results; 6) develop observation results with the aid of tools (microscope or magnifying glass); and 7) re-check observation results by repeating the observation (Johnston, 2005: 34-37; Harlen & Qualter, 2004: 154; Eberbach and Crowley, 2009:40).

Classifying process skills in early childhood describe the child's knowledge of rules or theories about the objects that are characterized by the ability to distinguish the characteristics or properties of various objects, as well as being able to identify the similarities of feature of the object observed (Wolfinger in Yulianti andDewanti, 2008: 8; Bredekamp & Copple in McDonell, 2009 : 63). Based on this, it is known that a good classification skill must be preceded by good observing skill too (Johnston, 2005: 24).

Children are actually able to recognize the similarities or differences between the characteristics and properties of various objects, but can not communicate verbally. Children are often called "*dust-bowl empiricist",* meaning that children do a lot of observation, but are not able to provide a straightforward explanation of the observations, making inferences, or linking observation results with the relevant theory (Eberbach and Crowley, 2009: 46).

Efforts which can be done to develop the skill of classifying is to provide opportunities for children to explore various collections of objects or natural phenomena. These activities should not become a burden to children with too many features or characteristics that must be observed to be the basis of the classification because it will hamper the development of children. In the animal theme, children are first to identify animals based on observations of the body structures or realia using images of animals, such as fish, turtles, frogs, cats, dogs, or birds. Classifying skill can be developed further by recognizing the special nature of physic used to eat, move or body cover (Johnston, 2005: 71).

2. METHOD AND DESIGN OF EDUCAITON

The method used was qualitative method. Qualitative approach was used to study and learn the game method implementation in scientific activities at TK B Laboratorium UPI Kampus Cibiru Cileunyi Subdistrict of Bandung District and its influence on science process skills of early childhood. Subject of research were children aged 5-6 years. The research method emphasizes on a study originated from the natural situation in the field. The design of selected was qualitative design Naturalistic compiled based on the principles of the background of the situation and field conditions (Sugiyono, 2011). Therefore, in this research it involved directly model teachers (Science lecturer for Early childhood) and kindergarten children in the process of learning activities.

According to Fraenkel and Walllen (2007: 279) This study design involves he presence of repeated measurements or observations during a certain time frame. Observations and measurements were performed when implemented games and learning activities.

3. RESULTS AND DISCUSSION

Science process skill of early childhood in activity by using games including several aspects. Aspects of familiarizing animal sounds observed with the sense of hearing with the lowest score was 0 and the highest score was 3, namely children were able to mention 3-4 animal sounds heard or 5 name of animals without the help of a teacher. On this theme games carried out by the child was by holding their friends' shoulder standing in front of him (like trains) and walking while singing the sounds of animals. There was also a game called *board rush game,* the children were asked to listen to the sound of an animal played through loudspeakers. Then the children ran to the pile of cards of image, and select an image appropriate to the animal sound played. After that, the selected image was affixed to the wall.

In the aspect of identifying differences in the animal sound, the highest score was 2 and the lowest score was 0. The indicator of highest score was when a child can able to mention 3-4 different animal sounds without the help of a teacher or 5 differences in animal sounds with the help of teachers.

In meeting 1, animals which were heard to their sound were bee, cat, cow, dog, and frog. Judging from the average score of 2.67 showing that the children had no difficulty in recalling animal sounds have heard. Meeting 2, animals which were introduced their voice were birds, chickens, horses, sheep and ducks. The average score obtained was 2.7. There was an increase of 0.03 points, because there were more children who answered, even if the answer was lowering the average score.

In meeting 2, the game carried out was that teacher asked the students to run to observe, run and touch the animal pictures taped to the wall after the teacher name the animal. Then the teacher asked the childredn to imitate the sound of an animal whose image has been touched by the child. In the aspect of recognizing difference of animal sounds, at the first meeting, the average score was 2. This means that all the children looked to be able to distinguish animal noises heard. There is a decrease in the average score of 2 to 1.9 because there are children who just want to mention 1 difference in the sound of animals.

The average score of class to recognize animal sounds is 2, 32 from the highest score of 2.5. It means that the children were averagely easy in recognizing the sound of animals observed through the senses of hearing.

In meeting 3, animals observed were in physical features such as cats, sheeps, and frogs. A game developed was "Blindfolded". In this game, the children were divided into two groups to compete one another in completing animal parts in the template of animal body taped on the wall which has been provided by the teacher previously.

Children were lined up in their respective groups. Then the first member of each group was blindfolded and then to the box containing parts of the body of animals. For the media sheeps were used as the replica of sheep , while frogs and cats it was using living animals. Tests conducted orally and individually by using pictures and replicas of animals such as sheep, frogs and cats.

In mentioning the physical characteristics of the body of the animal, the highest score was 3 in which they were ble to name more than 6 physical characteristics of parts of the animal's body with the help of a teacher. The average score of the children class was 2.56.

In the skill of identifying the differences of physical features of sheeps, frogs, and cats. The highest score was 3, namely if the children able to mention more than 5 differences part of body among the three animals. From the results of record of average score obtained by the children was 2,33.

In identifying the similarities of body parts of animals such as cat, sheep, and frod, the highest score was 3 if the children able to metnion more than 5 similarities of body parts of animals such as cat, sheep, and frog. Average acquisition of class score was 2, 44.

In meeting 4, still playing with the game called "blindfolded". Animals observed were the physical features such as fish, tutle, and birds. For the media, it was using living animals. The test was carried out orally and individually by using images and replicates of animal.

In mentioning physical features, the highest score was 3, namely they were able to mentione more than 6 physical features of body part of animal by the help of teacher or mentioning 4-6 physical features of animal body parts without the help of teacher. Average score of the class was 2, 67.

For the skill to identify differences in physical features of sheep, frog, and cat, the highest score was 3, namely if children able to mention more than 5 differences of body parts among the three animals mentioned. From the results of average score data records, the score obtained by the children were 2 55.

In identifying similarities of animal body part such as cat, sheep, and frog. The highest score was 3 if children able to mention more than 5 similarities of animal body part such as bird, fish, and turtle. Average acquisition score were 2, 33. The average score of the class with sub-theme of animal body parts in the aspect of observation were 2, 46.

In meeting 5 by subtheme of body covers, the game played by the children was called "Pick the correct one", children were asked to identify the animal's body cover appropriate with the instruction of the teacher. Teachers have set up replicas of animals with different animal body cover. A replica of the animal is kept in front of the class. Children were divided into two groups. Then the teacher mentioned body cover types that exist in animals, children ran to get the animal which has a cover body mentioned by the teacher.

Acquisition of score on subtheme of animal bodies cover of fish, birds, turtles, cats, sheep, and the average was 2.46. The medium used for fish, turtles, fish, birds and cats was a real animal, while for the sheep it was using a replica.

In the aspect of science process skills of observing, with the indicators mentioning the physical characteristics of an animal body part such as cats, sheep, birds, fish, frogs, sheep and turtles. The highest score was 3 when the child able to name more than 5 physical characteristics of the animal's body cover with the help of a teacher or mentioned 3-5 physical characteristics of body cover without the help of a teacher. And based on the data all children received a score of 3.

Aspects of observations on science process skills in science process skills indicators mentioned differences in the animal body cover such as cat, sheep, birds, fish, frogs, and turtles. The highest score of 3 if the child able to name more than 5 physical characteristics of body cover differences in the animal's body without the help of a teacher and as a result all the children received a score of 3.

Science process skills in the aspects of grouping with the indicator of children able to classify animals based on body cover such as skin, fur, hair, scales, shells and wool. The highest score was 4 when children able to classify more than 2 animals by body cover precisely and able to explain the basis for the classification without the help of a teacher. The average score obtained by the children was 3.33.

In meeting 6 with a subtheme of animal habitats, the game performed by children was taking pictures of animals mentioned by a teacher and paste it to the image of animal habitats that exist on the walls. Data of science process skills in the aspects of observing and identifying the characteristics of aquatic habitat, land (above, in the ground, as well as on the tree). The highest score was 3 if children were able to identify more than 4 characteristics in the habitat of animals without the help of a teacher. The average score obtained by the class was 2,29.

Science process skills in the classifying aspect, the highest score was 3, when children were able to classify more than 5 animals based on their habitat without the help of a teacher. The average score obtained based on the data was 2.14. The average skills acquired in the 6th meeting was 2,21.

In meeting 7 a subtheme studied was animal foods, with the science process skills in the aspect of classifying animals based on the type of food. The highest score was 4 if the children were able to classify more than 2 animals based on foods properly and able to explain the basis for the classification without the help of a teacher. All children received a score of 4.

From the data obtained during the research was carried out, scientific process skill in children particularly in the aspect of observation, averagely on good category, because basically children have known animals which became the theme of learning. Sound of animals, averagely have been heard by children, and the children able to repeat and memorize again the sound quickly. Songs about animals used during the learning process also helped the students to memorize again the animal sound once heard. One of the ways to observe environment is by using the sense of hearing. From an early age, child knows the environment through the senses of hearing, and everything heard by the children will be easily repeated by the children again. But the skills of observing is not only consisting of activities that use the sense of sight, but covers all the senses, to identify similarities and differences between the object being observed, and interpret observation result (Johnston, 2005: 345; Harlen & Qualter, 2004:154; Eberbach and Crowley, 2009:40).

Scores on the verbal test results performed individually at the 1st meeting was to recall the sound of bees, cats, cows, dogs, frogs and the average grade was 2.67. The sound of these animals were no stranger in the ears of the children. Ganjar, although it is difficult to distinguish between the sounds of bees and frogs, but he can imitate the sound of bees and frogs, because in the record it was rather difficult to distinguish between the sounds of bees and frogs. There was only one student who did not want to do tests or interviewed. From the beginning, this child was not active in talking, always shy away when asked but in a learning process, he was normal.

The average score on the class obtained to show the difference in the sound of the animals, all the children were able to do the task, except Nani. Scores obtained by Nani was 1, the scores obtained during the learning process took place, because the observer observed. Nani guessed animal sounds and able to distinguish them, but only 1 animal , so the score obtained was 1.

At the 2nd meeting, almost all children were able to remember animal sounds once heard except Sobri that sometimes less concentrated and Nani who did not want to speak. Meanwhile, when there were two or more animal sound played again, the children were able to distinguish them, this was due to comparison.

The second sub-theme was the physical characteristics of animals introduced to children through animal observations such as fish, cats, birds, turtles and birds that the children were able to explore the animals. While sheep and frogs were using a replica. All children were already familiar with the animals existed prior to the learning process. Basically the children came to school by carrying the original knowledge acquired through interaction with the physical environment, social, and natural outside the school (Widodo, Wuryastuti, Yuliariatiningsih: 2010; 101). Children loved to do exploration of something new through observation. Although the animals explored were already known, but observing by seeing and holding the animals is an activity that is not boring to children, because these activities as part of the process of playing at the same time learning through observations. Yulianti research and Dewanti (2008: 1-6), concluded that the method to learn while playing could develop science process skills of kindergarten students in the aspect of observing, classifying and making conclusions about the object.

Children did not know the word "differences and similarities", so when they were asked the differences and similarities between the animals observed , no one can answer. Therefore, teachers simplify the question with the word "different or the same? What is the difference and what is the similarity "? children can not mention some of the differences and similarities at the same time, but each answer, must be accompanied by follow-up questions. It means that children did not understand , but they were just not accustomed to answering some characteristics at once, so the difficulty was rather in the language and not the skills to distinguish and observe similarities from the observation results. Johnston said that in the early stages of development of classifying skill, children will be able to put objects into certain groups, but are not able to explain the basis of classification. A child is actually able to recognize the similarities or differences in characteristics of various objects, but can not communicate verbally (Eberbach and Crowley, 2009: 46).

Subtheme of the animal's body cover, carried out by observing the animals such as those mentioned above. Children were happy to stroking and touching the animals, although there were some who were afraid to feel the tortoise. Animals in which mostly wanted to be petted and picked up was Persian cat because the body covers are soft and docile animal. All children observed by holding and touching scales as the cover of the body of the fish placed in jars. Some children tried to put the body of a turtle on the hands, touching the shell that covers the body. But some were just lettting go of them because the nail of the turtles were rather sharpand thus were somewhat sore on the hand. Children observed bird feathers covering the body by touching though that bird was placed in a cage. This activity is in line with the opinion of Suyanto (2005: 158) states that the introduction of science in kindergarten children by developing the ability of exploration and investigation, is activities to observe and investigate the object, develop basic science process skills in the aspects of observing, classifying, communicating and concluding observation result, as well as develop curiosity, pleasure and interest in understanding the knowledge.

Observing process skills test using animals replica covered indicates that all students obtained the highest score of 3, but some children were still difficult to distinguish between wool with hair that in the aspect of classifying only two children who got the highest score. Exploring activities by touching, memory precipitate to the children on the cover of the animal's body and the body cover name of an animal's body, although not looking at the animal, and able to classify.

In the sub-theme of animal habitats, the acquisition of class average score as the lowest score was in the spec to observe 2.29 or 76.19% and classifying 2.14 or 71.43%. This is due to the medium of film used was less clear, because it was using classrooms that were too bright to play the movie. The film shown to children were also less attractive, because it was not the film taken from The BBC Knowledge, but downloaded from YouTube. In this case the process of learning about the child's attention resulting in a child's learning outcomes. This is supported by Harlen et al, 2003: 63, that teachers need to pay attention to the media or devices used to not make children get bored.

In the sub-theme of pet food, or 100% of all children received the highest score at 4. The game of guessing and media in the form of images used during the learning process increased the children's memory while observing animals and their foods. All the children were able to classify more than 2

animals by type of their foods. Flash cards were used to help children to recall which has been learned during the learning process in using science process skills of observing with the senses of sight. In regards to the opinion of Johnston, 2005: 36-37; Harlen & Quarter, 2004: 101-102, 158 that teachers should strive to develop observation results, giving children the opportunity to recognize the similarities and differences of the object being observed and allow time for the children to develop skills to observe. Johnston, 2005: 71 completes with the statement that by recognizing specific physical properties used to eat, then the children could classify animals based on the type of food.

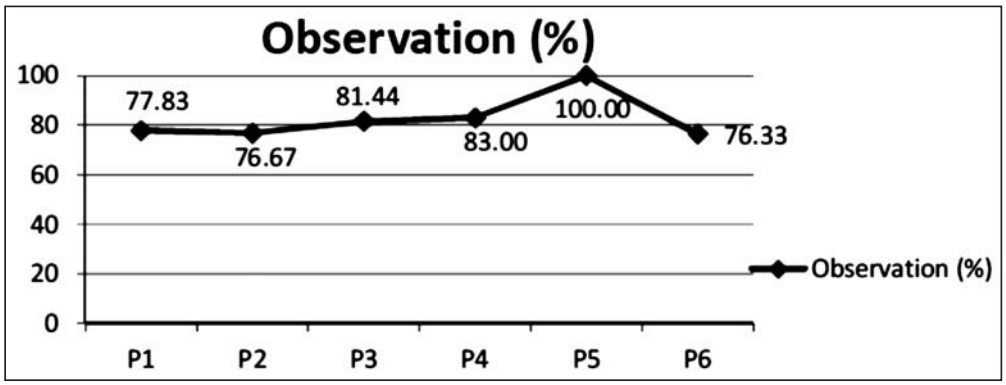

Figure 1: Develoment of children process skills in the aspect of observing

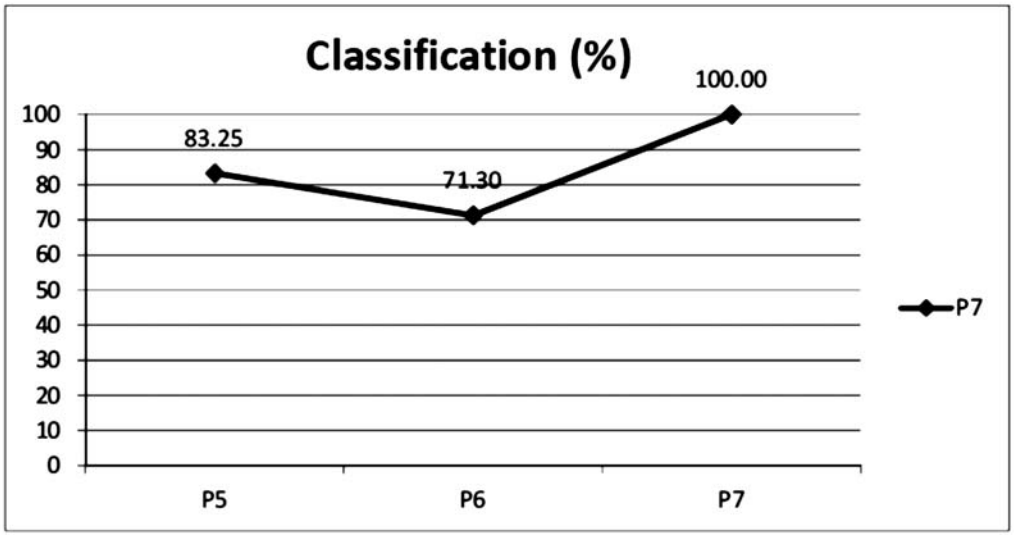

Figure 2: Development of scientific process skill in the aspect of categorizing

Description : P = Meeting

From the restuls of the research, it shows that skills in the aspect of observation or categorizing experiences an increase and decrease in every meeting. The condition such as aforementioned is very depending on the willingness of the children in following oral test, learning process and object studied. The lowest acquisition is in the meeting 6 about the habits of animals. The lack of real object and meadi studied was less interesting to children in the learning process. From this research's results also obtained children's behavior in controlling emotions affecting the learning process and results of learning.

4. CONCLUSION

Abilities and science process skills in the aspect of observation and categorizing in early children age may develop by using games method. To develop science process skills in the aspect of observation for kindergarten children needed a longer time than older children (SD), therefore when the children were playing with the animals as the process of observation should not be limited by time. Let the children play

to feel satisfied, because actually kindergaten children are not bound by the study hours. When children observed the animals, the teacher could ask a few questions to develop the children observation skills. It takes attention by teacher at the time children perform observation to animals, children need to use gloves if necessary.

Kindergarten children have the skills to observe, but the ability to understand the language used by teachers made the children as if they do not understand the concept. Therefore, use language that is easily understood by children when asked as describing again with standard Indonesian , then ask to repeat. Children have the skills to classify when they were able to understand the similarities and differences. So the science process skills in the aspect of observation and classifying can be applied to a kindergartner. Games can be modified by teachers in accordance with a particular theme. Children like to move around, such as running, jumping, crawling, and standing on tiptoe. Types of games should be parallel, to avoid competition.

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