SCIENCE LEARNING IN EARLY CHILDHOOD

Dwiyani Marsetyaningrum

PP-PAUD dan Dikmas, West Java

dee_marstya@yahoo.co.id

ABSTRACT

Science trains children experimenting with carrying out multiple experiments, enriching children's insights to always want to try and try. So that science can lead and encourage children to be a creative and full of initiative and can build a knowledge that later can be used in adulthood. Science familiarizes children following the experimental stages and should not hide a failure. That is, science can train positive mental, logical thinking, and order (systematic). In addition, it can also train children to be careful, because children must observe, make predictions, and make decisions. The introduction of early science should be tailored to the child's developmental level and characteristics, the educator does not stuff the child with the concept but facilitates the child to discover facts and concepts in a simple experiment. Like scientists, children need skills on how to use observing, classifying, measuring, predicting, experimenting and communicating skills. Basically, activities in the concept of science can be learned through simple and simple daily experiences. Fun and exciting atmosphere will motivate the child to continuously seek answers to what the child thinks and prove because in essence the child is born with something miraculous to bring curiosity or find out about what he saw, heard and felt in the neighborhood.

Keywords: Learning, Science, Early Childhood

INTRODUCTION

Children are natural scientists because through the senses of the child can observe the surrounding natural phenomena. Early childhood learning by involving the child's environment, can enrich the child's experience. Children will learn to experiment, explore and investigate the surrounding environment. To encourage this much can be done by educators, parents and other adults in facilitating children to grow into creative and innovative scientists. Introduce science to children does not mean introducing formulas. The atmosphere must be fun, so the child in a cheerful state will ask why is that? What happened next? Etc. Keep in mind, introducing science to children must be in accordance with the stages of age and development. Most of the time the early childhood is spent with parents. So what a parent or teacher needs to do is spend a little time playing with the child. In that playing situation, we can do science experiments.

Irawati (Nuraini 2010: 35)[1] argues that "play is the need of all children, especially for children stretched ages 3-6 years, a play is an activity that children do with or without using tools that generate understanding and provide information, give pleasure and develop the imagination of children spontaneously and without burden ". At the time of play, activities take place almost all aspects of child development can be stimulated and well developed including the development of creativity.

Many benefits can be obtained if the child from an early age has been introduced to science. Science trains children experimenting with carrying out multiple experiments, enriching children's insights to always want to try and try. So that science can lead and encourage children to be a creative and full of initiative and can build a knowledge that later can be used in adulthood. Science familiarizes children following the experimental stages and should not hide a failure. That is, science can train positive mental, logical thinking, and order (systematic). In addition, it can also train children to be careful, because children must observe, make predictions, and make decisions.

The problem is the level of ability of teachers or parents who are still very limited about the concept of science and the method or approach used. In addition, there is also the assumption that science learning is difficult to apply to children of early age. The impact is that children are not explored the potential of basic science skills that can be utilized in the future.

DISCUSSION

A. Understanding of Learning

According to Dimyati and Mudjiono (1999), Learning is a programmable teacher activity in instructional design, to make students learn actively, emphasizing the provision of learning resources.[2] While Surya (2002: 11) defines the learning model as follows: "Learning is a process by individuals to gain a whole new behavioral change, as a result of the individual's own experience in interacting with his environment ". A teacher's understanding of the meaning of learning will affect the way the teacher teaches. Various definitions put forward by experts, in general learning is defined as a process of change that changes in behavior as a result of interaction between himself and his environment in meeting the needs of his life.[3]

Early childhood learning in recent years, especially those held in PAUD institutions tend to be formalized, with teacher orientation, as well as an emphasis on literacy, writing, arithmetic, formal assignment or formal homework. These learning practices are not only due to parents' demands for more academic but because of the many new research that shows that early childhood is ready for formal academic learning. Many of the educational practices that provide less freedom of space for children in developing their personality. They do a lot of boring learning activities, with many sitting on the bench, listening, recording, memorizing and following the wishes of the teacher. These conditions will endanger the development of early childhood does not even close the possibility of many who experience stress or mental stress because what they experience is not in accordance with the stage of its development. Therefore, in the process of early childhood education and learning it is necessary to be developmentally Appropriate Practice (DAP) (Mulyasa, 2012, p.146) .[4]

B. Understanding of Science

In terms of language, science or science (in English), derived from the Latin word of Scientia that means knowledge. But scholars regard the precise etymological constraint of science from German, it refers to the word Wissenschaft, which has a systematically organized or organized understanding of knowledge. According to Eshach & Fried (in Trundle, 2005: 1), early childhood science is crucial in developing some aspects of child

development, the researchers suggest that science should begin early in the education phase. Teaching science in early childhood aims to have children tend to enjoy observation activities and think about nature. Children are motivated in exploring the world or the environment around the child. Science learning experiences for children will help children understand their world, gather and organize information, apply and test ideas and develop positive attitudes toward science.[5]

Broadly speaking, science is the study of natural phenomena which includes living creatures (Life Science) which consists of biology, zoology and botany, a living creature (Physical Science) consisting of physics, chemistry, geology and astronomy, and the environment (Environment Science) which consists of atmospheric science, ecology, environmental chemistry, and geoscience. Environmental science also studies natural phenomena as well as how to instill awareness and concern for nature/environment. Science is acquired and developed by scientists (scientists) through a method called the scientific method. This method is used to conduct a series of researchers in seeking answers to the "what, why and how" questions of natural phenomena that include life science and physical science and realize it in the form of technology and how it is applied in everyday life.

C. Benefits of Early Childhood Science Games

1. In general, the benefits of science for early childhood include:

a) Facilitating the growth and development of children optimally
b) Giving knowledge about nature and how to behave towards nature
c) Inculcating a scientific life attitude such as objective attitude, unhurried in taking conclusions, open, distinguishing between facts and opinions, being cautious and having a curiosity to investigate
d) Instilling a sense of love for the natural surroundings so as to realize the greatness of God Almighty
e) Enhance creativity and innovation

2. The benefits of science are seen from its basic substance

No	The dimensions of science	Developable Goals	Personal Form
1.	Science as a Product	- Mastery of facts, concepts, principles, and theories (collection of knowledge) - Mastery of everything found in the field of science - Ability to explain everything he knows adequately - Ability to explain how to master the science products - Mastery of science as a product in a comprehensive and intact	- Have basic skills for the needs of life - Have skills in acquiring, developing and applying the concept of science in his life
2.	Science as a	- Mastery of skills required in	- Have a scientific

	Process	digging and discovering science - Mastering the working procedures of exposing nature/environment by following the scientific process - Mastering the ways in solving problems related to science - Have skills: observe, classify, measure, describe, explain, ask questions, formulate problems, predict probability, design experiment, collect data, analyze data, draw conclusions	attitude and use his approach to solving the problems of life he faced - Having an awareness of the regularity of nature and all the beauty around it so that it arises to love and nurture it
3.	Science as Attitude	- Forming a personal scientist - Growing attitudes: honest, critical, creative, positive to failure, humble, not easily discouraged, openness to criticism and testing, respecting and receiving feedback, guided by facts and data, maintaining high curiosity	- Have a more meaningful level of creativity and innovation - Growing and growing interest in further study in the field of science in particular and other fields in general.

Table 1. Schematic dimensions, objectives, and targets of science learning development in early childhood

D. The Process of Scientific Discovery In Early Childhood

Collective discovery between educators and children at school or between children and parents at home can be done, among others, by observing something or listening to questions and opinions of children. Find out about what makes a child interested and make plans to realize the attraction. Talk about findings that interest children, such as changes in shape, weather etc. Things to consider in exploring together include:

1. We do not need to know all the answers. Sometimes the child wants to know everything and a barrage of questions makes us run out of answers. Instead of trying to answer all the questions, it's better to say "let's find the answers together." Guiding the children to the library or asking neighbors, merchants, doctor nurses and others. Show the children how to get as much information as possible to know everything.
2. Help the child to be a good observer. Observing is not merely seeing because of the process of observing using all the senses that we have. This means that we perform activities simultaneously to find out what is happening in our enclosure. Tell the child "see ....., listen .... feel ..... touch and smell the smells around us." Encourage children to be aware of weather, season, pet and self-changes themselves.

3. Encourage the child to experiment together. Children sometimes ask "what happens if ...?" We have to answer "that's a good question, let's try to find out together." Encourage the child to guess what will happen and let the child experiment as much as possible. For example in ice melting experiment. An educator is playing ice cubes with a 5-year-old child. The child will hold the ice cubes in warm water and observe the ice will melt. Children will also see when directly under the hot sun, ice cubes will melt faster. From that experience the child has learned a process of thinking, having reason and experience can be used to solve the problem. When children hold ice cubes in hand, educators can ask, "Well, look .... hands, warm water, and the sun can make ice melt. How can that be? "With such questions, educators are inviting children's explorations beyond the facts. That is, educators are inviting children to think and solve problems. The child needs to combine the facts together and know the cause and effect answers. Teaching children about facts is different from teaching children how to use facts to think, reason and solve problems.
4. Listen to children's ideas and opinions. When a child describes something happening, it shows that he is thinking. Remember that at that age the correct answer is not important. But the most important is the process when the child creates ideas, guesses and draws conclusions based on his thoughts.
5. Help the child grow by loving science. Share ideas and knowledge, games, knowledge, and learn together. For example, show the various dwellings of living things in this world, so that children can see humans and other living things have their place in the world.

E. Early Childhood Science Learning Signs

The introduction of early science should be tailored to the child's developmental level and characteristics, the educator does not stuff the child with the concept but facilitates the child to discover facts and concepts in a simple experiment. Here are early learning signs of early childhood science:

1. Be concrete.
   The objects used to play in learning activities are concrete (real) objects. Educators should provide the various objects and other facilities necessary for the child to discover the concept itself.
2. The cause and effect relationship is seen directly.
   Children aged 5-6 years still have difficulty connecting causes that are not directly visible because of their transductive thoughts. The child can not connect the cause that is not directly visible. If the child sees the event directly, make the child able to know the cause and effect relationship that occurred. Science is rich in activities that train children to link cause and effect.
3. Allow children to explore.
   Science activities should allow children to explore the various objects that exist around. Educators can present interesting objects and phenomena into learning. For example, doing a simple experiment, let the child try, do the experiment himself, try other alternatives and think creatively. The child will also be able to use almost all of his senses to explore or investigate.
4. Allow children to construct their own knowledge.
   Science does not train children to remember objects, but train children to construct knowledge based on that object. Therefore, the introduction of science activities is

not enough to tell the definition or the names of the objects but allows the child to interact directly with the object and gain knowledge with the various senses of the object. It is therefore not appropriate to introduce children to various objects through pictures or models. The child needs the real object.

5. Allows the child to answer the "what" issue rather than the "why".
Children's limitations link causality to make it difficult for the child to answer the question "why". The question must be answered with the logic of causal thinking. If the child plays with water in the pipe then the child is asked: "what will happen if the tip of the pipe is raised?". The child can reply, "water will flow through the other lower end." No need to be asked: "why if this tip is raised, water will multiply to the lower end"? It can not be answered by the child. Often the child translates the question 'why' with 'for what', so the question of why will be answered "in order" or "lest".
6. More emphasis on the process than the product.
Doing exploration activities with objects will be very fun for children. Children do not think what the results. Therefore educators do not need to stuff the child with various science concepts or require the child to produce something from the child's activities. Let the child naturally find the various notions of his interaction playing with various objects. In other words, the process is more important than the product.
7. Allows children to use language and math
Introduction to science should be integrated with other disciplines, such as language, mathematics, art and/or character. Through children's science explores objects. The child can tell the result of his exploration to his friend (language). The child takes measurements, uses numbers, and reads numbers (math). The child can also describe the object observed and color the picture (art). Children are also taught to love the environment or objects around it (minds).
8. Presenting interesting activities (the wonder of science)
Science presents various interesting experiments like magic. Children who still have a magical mind (magical reasoning) will be very interested in the miracle.

F. The Role of Adults in Early-Childhood Science Learning

Important roles parents or educators can play in developing science in early childhood include:

1. Create a learning strategy that is appropriate to the situation and conditions by paying attention to what the child likes or desires when the science activities take place
2. Motivating children to enjoy and explore science, by asking many questions about what the child is doing, always encouraging children to explore and as often as possible performing simple experiments
3. Being a resource for children, but it does not mean to know all the answers, but must give more understanding and always stimulate by asking about what they think.
4. Allow children to always explore, discover and learn something based on what the child wants to know.

G. Skills in Science Learning

Like scientists, children need skills on how to use observing, classifying, measuring,

predicting, experimenting and communicating skills.

1. Observation
   Observation is the key to all science activities. Focus on observation by getting the child to identify the specific object, ask what they see, hear, smell, try and feel. Next help the child see various shapes or characteristics of the observed object, such as size, shape, texture, color and so on. One of the hallmarks of a scientist is always to see and observe.
2. Classification
   Classification is a very important ability to understand and understand the contents of the world both plants and technology. Children classify in an easy way, like searching for similarities and differences. Most children can match the same shape of an object or image, even they can learn the same simple but not identical objects. An example is with the same object or color. As children begin to think, they begin to understand that each object has more than one category
3. Measure
   Measuring skills can be obtained by children while exploring. Give the child a chance to conduct a measuring activity such as identifying which is larger and smaller, longer and shorter, higher and lower to more difficult levels such as the distance between one tree and another.
4. Estimates
   Estimates are the ability to predict objects based on experiences experienced by children, starting from simple activities such as "What happens if I touch a bubble?" Or make guesses like "What happens when a balloon is blown continuously?" Furthermore, at the level of progress higher, the child will be able to sort through different objects, such as which one is more easily burned between paper or metal.
5. Experiments
   Experiments were conducted through various experiments with other teachers or adults. Experiments can be done with tools such as mixing color activities, and without special tools, such as the activity of touching the hands to cold objects like ice.
6. Communication
   Communication is the ability to use words to describe, explain or summarize the results of discussions about science activities that have been done. Introduce a variety of science vocabulary that is appropriate to express their experience. For that cause the child to always remember or record about what is observed or demonstrate in front of his friends and hold exhibitions of children's work.

H. Some Simple Trial Material and Examples

1. Motion
   Children love to play with moving objects, the activity of rolling objects either on flat or oblique surfaces can awaken any child that affects the speed of moving objects such as the slope of the base, the shape of the object, the coarse-fine, the small size, the light weight. This material also trains the child to make observations.
2. Liquid objects
   Playing with water is a very popular thing for children, children are invited to know the nature of water as water can adjust the shape of the place, flowing from high to low. Activities to convert volumes can be done by early childhood such as moving water from large places too small places or floating, dissolving and insoluble

drowning experiments, and introducing other liquid items other than water such as oil, honey, oil.

3. Plants and Animals
   Sometimes children assume that the plants of inanimate objects, we can introduce to the child that plants are living things by introducing its characteristics. Introduce how plants and animals grow, interact with plants and animals. Introducing plants and animals in early childhood teaches children to appreciate sentient beings, learning that living things require eating, drinking, and shelter, which in turn will foster a sense of affection for sentient beings.
4. Air
   The concept of air is abstract for the early childhood but we can recognize that around us there is air, air occupies space, air presses in all directions through simple games.

SCIENCE GAMES FOR EARLY CHILDHOOD

PLANT GROWTH

1. **Age** : 5-6 Years
2. **Materials and Tools** :
   a) A number of seeds or nuts that grow rapidly. Eg green beans or peanuts
   b) One glass for each child
   c) Cotton or planting medium to taste
   d) Water sufficiently, to wet the planting medium
   e) The ruler size is 30 cm
   f) Recording device
3. **Experimental Steps** :
   a) Demonstrate to the child how to do the seeding or planting the beans slowly, so that children can catch the sequence and how well
   b) Check all children's readiness to follow the activity. If all children are ready, then give them a chance to experiment and do it. Activities can be done individually or in groups. If the group should not be too large group, just 3 to 4 people only
   c) If the child has not been able to write, help the child by recording the identity of the seed and related things, for example: the name of the seed of the beans, the date and time of the seedling, seed size: large, round, and so on. And label or group the name of each pot or medium, by sticking or hanging on the edge of the pot
   d) Remind that the child/group, should record progress according to the agreement of educator and child. Do it on an ongoing basis.
   e) After the observation, the child is asked to tell the growth of the plant from the seeds!
4. **Questions** : How do roots and buds grow from a seed?

Children recognize how something grows and seeds grow into edible plants. Children learn that seeds need water and light to grow.

FLOATING OR DROWNING ME?

1. **Age** : 4-6 Years
2. **Materials and Tools** : Oranges of various sizes, basins or buckets
3. **Experimental Steps** :
   a) Provide a basin or bucket filled with water ¾ bucket.
   b) Ask the child to enter oranges of various sizes one by one that still has skin
   c) Let stand for 2-3 minutes, observe what happens.
   d) Then enter the oranges that have been peeled until clean into the water.
   e) Observe what happens.
4. **Questions**
   a) What happens when oranges of unpowered sizes are put in water? Why does it happen?
   b) What happens when oranges of various sizes have been peeled into the water? Why does it happen?
   c) What happens besides peeling off how about when given with salt, with what else can the oranges float?

The game of orange and the floating law floats the sinking of Archimedes (explaining that his unpeeled orange will float, but when his skin is peeled will drown) because the orange peel contains a lot of air.

LIFT UP WITH A BALLOON

1. **Age** : 3-6 Years
2. **Materials and Tools** : glass of glass, plastic cup, balloon
3. **Experimental steps** :
   a) Put the balloon into the glass and the mouth of the balloon is on top
   b) Blow the balloon in a glass
   c) The balloon will enlarge inside the glass and can lift the glass
   d) Do also for plastic cups
4. **Questions**
   a) What happened? Why did it happen?
   b) Why can balloons easily lift glasses? Why does it happen?

The balloon when blown has a thrust and presses the inner glass wall so that the glass can be lifted

FLOWERS OF DIFFERENT COLORS

1. **Age** : 4-6 Years
2. **Materials and Tools** : 3 glass bottles or used mineral water bottles, water, food coloring (3 colors), scissors, 3 fresh white flower stalks
3. **Experimental steps** :

a) Fill three glass bottles with water approximately ¾ bottles and add a few drops of different food coloring to each bottle
b) Take three fresh white flower stalks
c) Cut the stalks of each flower and place them in the bottled) Leave the flowers in the bottle for 10-12 hours
d) Each interest will change its color according to the color of the water it occupies.

4. Questions

a) What happens when a flower stalk is put into colored water?
b) Why did it happen?

> Water will seep into the stalk of each flower, then spread to all parts of the flower, including flower petals. The water then goes from plant to air through evaporation. The flower retains that color.

CONCLUSION

Basically, activities in the concept of science can be learned through simple and simple daily experiences. Fun and exciting atmosphere will motivate the child to continuously seek answers to what the child thinks and prove it because in essence the child is born with something miraculous to bring curiosity or find out about what he saw, heard and felt in the neighborhood. The various skills children can perform the game of science include observing skills, classifying, measuring, estimating, experimenting and communicating. Stages in every chronological age and development determine the type and level of difficulty in the game of science. Therefore the game of science must be given from the simple things to the complex.

REFERENCES

1. Paud DI, Al IT, City F, Aceh B. No Title. 2016; 1 (1): 1-10.
2. Setiawati N, Introduction A, Discussion B. KOLAM BENING AS LEARNING LEARNING MEDIA BECAUSE OF FLOATING AND SUN. 2014; 6 (1): 48-52.
3. Eprilia UH, Prasetyarini A, Paud J, Teacher Training, Situation A. Training of early childhood learning models at post paud subdistrict delanggu, klaten district. 1988.
4. Learning P, Age A, D-Oriented, School G, Smart D, Bandung M. Learning Process of Early-Growth-Oriented Developmental .... (Hernawati). 2013.
5. Constructivistic P. DEVELOPMENT OF EMPLOYEE WORKSHEET USING ABILITY OF SAINS CHILDREN EARTH EARTH Hardiyanti Pratiwi *) Mustaji **). 2016; 1: 23-31.