Implementation of Learning Methods Using a Neuroscience Approach in Early Childhood Education Units

Sri Suparmiyati[1], Fakrudin Arbah[2], Neti Karnati[3]
Education Management
Universitas Negeri Jakarta
Jakarta, Indonesia
hartini.hadian@gmail.com

Abstract— Education is an important asset for the progress of a nation. Therefore, every citizen must and is obliged to attend a level of education, including early childhood education, primary education, secondary and higher education. Most Indonesian children, when starting the process of entering educational institutions, ignore early childhood education, even though education from an early age is absolutely necessary to get used to and develop children's mindsets. The aim of this mini research is to explain the implementation of learning methods using a neuroscience approach in Early Childhood Education Units. Writing this mini article used a library research approach. The results show that Neuroscience is a science that studies the nervous system of the human brain. Neuroscience also studies consciousness and brain sensitivity in terms of biology, perception, memory, and its relationship to learning.

Keywords— ***supervision; control and evaluation***

I. INTRODUCTION

Education is an important asset for the progress of a nation. Therefore, every citizen must and is obliged to attend a level of education, whether early childhood education, primary education, secondary or higher education. Most Indonesian children, when starting the process of entering educational institutions, ignore early childhood education, even though education from an early age is absolutely necessary to get used to and develop children's mindsets.

Countries that have experienced the positive effects of early childhood education include Japan, America, Singapore, and even another large country, namely China. According to the World Health Organization (WHO), Japan is listed as the most prosperous country and has the highest life expectancy in the world. America was able to lead its citizens and country to become a competitive nation in the world as a result of implementing the head-start program for early childhood starting in the early 60s. Singapore is noted as a country with limited natural resources, but has extraordinary advantages, because it has a focus on human resource (HR) development that is established from an early age. Another large country, namely China, is also very active in early childhood education and has now become a country whose progress is highly regarded, even respected by other superpowers.

Based on a review of pedagogical aspects, early childhood is the initial foundation period for further growth and development. It is believed that a happy childhood is the basis for future success and vice versa. So, in order for optimal growth and development to be achieved, a conducive situation and conditions are needed when providing stimulus and education that suits the child's needs and interests. Theoretically, based on aspects of development, a child can learn best if their physical needs are met and they feel psychologically safe and comfortable.

According to Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, the definition of early childhood education is a coaching effort aimed at children from birth to the age of six which is carried out through providing educational stimuli to help physical and spiritual growth and development so that Children are ready to enter further education. The main goal is to form quality Indonesian children, namely children who grow and develop according to their level of development so that they have optimal readiness to enter basic education and navigate life as adults.

Meanwhile, according to Prof. Dr. Lydia Freyani, on the Board of Professors at the Faculty of Psychology, University of Indonesia, said that activities in PAUD can provide educational stimulation that is appropriate to the growth and development stages of pre-school aged children. All activities are carried out through a play while learning approach. Early Childhood Education (PAUD) is very important for the

development of children aged 0-6 years. In this phase, children experience increased physical growth and brain function (golden age). During this period, children's brain cells develop very quickly, up to 80 percent, so they are able to receive and absorb information quickly. This means that children need quality stimulants that are useful for their future. Stimulants or stimulation from an early age are what determine the formation of good character, intelligence and physique. For this reason, PAUD is needed as a place for children's learning.

Currently, Indonesian society has awareness in this direction, but with Indonesia's large area and population, early childhood education institutions are still limited and many do not meet the criteria for early childhood education. Education for early childhood is providing efforts to stimulate, guide, nurture and provide learning activities that will produce children's abilities and skills. Early childhood education is a form of education that focuses on laying the foundation for physical growth and development (fine and gross motor coordination), intelligence, creativity, emotional intelligence and spiritual intelligence.

In line with this, various research results show that PAUD is the most basic education, and quality PAUD will greatly contribute to the quality of education at the next level. Like building a building, PAUD is the foundation that will influence the strength and durability of the building being built. That is why various studies also support the importance of PAUD, especially neuroscience (Neuroscience is a field of science that specializes in the scientific study of the nervous system)

II. METHODOLOGY

This article was written using a library research approach. Library study aims to collect and analyze data or information contained in the library, such as journals, research reports, scientific magazines, newspapers, relevant books, seminar results, scientific articles that have not been published, and other scientific data that related to the title of this article [1].

Data search process by searching and exploring literature from several electronic bases such as Google Scholar, Scopus, Direct of Open Access Journals (DOAJ), and Garuda Portal. Source selection is based on several criteria, namely: 1) the article or journal must be directly related to neuroscience and early childhood education; (2) search for related literature originating from research reports, national journals, international journals, related books, scientific articles, and scientific data related to the study of this article; (3) limiting the year of publication of literary works in the last ten years (2011-2020). The data obtained is then grouped based on journal type and presented in an article.

III. FINDING AND DISCUSSION

Etymologically, neuroscience is neural science which studies the nervous system, especially studying neurons or nerve cells with an approach through many branches of science. Meanwhile, in terms of terminology, neuroscience is a field of science that specializes in the scientific study of the nervous system. On this basis, neuroscience is also referred to as the science that studies the brain and all the functions of the spinal cord.

Basically, neuroscience is a branch of biological science that is developed in such a way as to achieve a certain focus of discussion. So the discussion of neuroscience in learning cannot be separated from its connection to the structure and functions of the brain. Nowadays, there have been many discoveries in the field of neuroscience, especially facts about children's brains. This discovery then leads us to the insight that early childhood (0-6 years old) is the golden age, or what we often call the golden age. In line with this, Howard Gardner stated that children in the first 5 years of age are always characterized by success in learning about various things.

Gardner's statement is just one of many psychologists who support the fact that young children tend to quickly grasp and understand things. So we can conclude that to create a quality generation, adequate education is needed from the age of 0-6 years, namely through Early Childhood Education (PAUD). Early age is the golden age, where at this stage children are always characterized by their ability to do many things. They have very high optimism for success, even though they don't always succeed. When a child is born, his brain cells reach 100 billion. These cells are interconnected, although only slightly, including brain cells that control the heart, breathing, hearing, reflex movements and life instincts.

Neuroscience can be defined as a science that specifically studies and evaluates the nervous system of neurons (nerve cells) in humans. Basically, the discussion of neuroscience in learning cannot be separated from the brain's structure and function. Neurokinesthetics is a program that aims to restore movement function to stimulate nerve maturation that can support the function of brain structures. Through neuroscience activities, Dr. Anne Gracia as an applied neuroscience practitioner and Togu Pardamean felt the need to incorporate this program into movement activities. Because researchers believe "Motor to Cognitive" will have a real impact on children.

Neuroscience is a new educational system that studies the functioning of the nervous system. Educators generally rarely pay attention to this problem. Neglect of this system causes the learning atmosphere to become dead. Etymologically, neuroscience is neural science which studies the nervous system, especially studying neurons or nerve cells with a multidisciplinary approach (Pasiak, 2012). In terminology, neuroscience is a field of science that specializes in the scientific study of the nervous system. Neuroscience is also referred to as the science that studies the brain and all other nervous functions [2]

Neuroscience is a field of study regarding the nervous system in the human brain. Neuroscience also studies consciousness and brain sensitivity in terms of biology,

perception, memory, and its relationship to learning. For Neuroscience theory, the nervous system and brain are the physical basis for the human learning process. Neuroscience is a field of scientific research on the nervous system, especially the brain. The study of the brain is fundamental in understanding how we feel and interact with the outside world and especially what humans experience and how humans influence others [3].

Neuroscience finds that all students' potential rests in their brains. It is further explained that newborn students have 100-200 billion neurons (nerve cells) and their intelligence develops by 50% until the child is 6 months old (Adi W. Gunawan, 2003). At the age of two years his brain development reaches 75%, and at the age of 10 years his intelligence development has reached 90%. After the age of ten, brain development becomes slower, so to achieve 100% intelligence development you have to wait until the child is 18 years old.

The first eight years of children experience rapid growth and development, and that period is called the golden age. The golden age will only occur once in a person's life, namely childhood. This is based on the results of research by Benjamin S. Bloom, an educational expert at the University of Chicago in the field of neurology, who stated that the growth of brain tissue cells in children aged 0-4 years reaches 50% until the age of 8 years [4]

The rapid development of the brain coincides with the child's physical development. For this reason, parents must provide stimulus so that children can grow and develop optimally. At birth, a child's brain has billions of nerve cells, but this number is lost after birth. When the brain gets new stimuli, it learns new things. Stimulation causes nerve cells to form new connections to store information. The cells used to store this information expand and also produce hormones necessary for the child's development, and those that are not or rarely stimulated will become extinct [5].

Regular and continuous stimulation will strengthen the connections between the nerves that have been formed, so that brain function automatically becomes better. Stimulation given from an early age

It can also affect a child's brain development. Early stimulation from 6 months of pregnancy to 3 years of age can cause changes in the size and function of brain chemicals [5]. Apart from strengthening brain tissue and nerve cells, providing good stimulation can also store all information related to behavior, tendencies and habits. Although the process is very complicated, it may not work. When compared to a computer, the human brain stores more than 100 billion bits of information [6]. Parents can provide stimuli with affection, love, appreciation, understanding and attention by paying attention to the child's age phase. Apart from that, it can also be done through direct experience using the five senses, providing a good example to children, because children will learn from what they see and hear.

Neuroscience studies humans as a whole or science that studies humans in an interdisciplinary manner. Neuroscience has several dimensions, including: 1) Cellular-Molecular, 2) Nervous System, 3) Behavioral Neuroscience and 4) Social Neuroscience (Socioscience).

This scope of cellular-molecular studies studies various types of nerve cells and how they perform specific functions that differ from each other to produce various complex behaviors, such as emotions, cognition, and action. More briefly, the three are emotions and ratios which are one unit in the neural network of common sense. The field of the nervous system studies nerve cells that function together in a complex system. For example, vision problems are studied in the "visual system"; movement problems are studied in the "isotonic system" or kinesthetic system; hearing problems are studied in the "auditory system"; etc. Behavioral neuroscience examines how the various nervous systems mentioned above work together to produce certain behaviors. For example, how the visual nerve, auditory nerve, motor nerve process information (subject matter) simultaneously (even though only one is dominant). Social Neuroscience studies how the human "social brain" plays a role in helping humans form relationships with others. The human ability to establish relationships with other people is a nature that is stored biologically in the brain. Although not a localized and easily identifiable system, the "social brain" has strong roots in interactions between its various parts.

Neuroscience divides brain anatomy into three hemispheres, namely: left brain, right brain and midbrain. The results of the work of the left brain are called IQ, the results of the work of the right brain are called EQ, and the results of the work of the middle brain are called SQ. Furthermore, Neuroscience explains that playing can activate the left brain (IQ), music can activate the right brain (EQ), while stories or socio-drama, especially great spiritual stories, can activate the middle brain (SQ).

Early Childhood is at the Golden Age stage where at that time, when experiencing rapid growth, during a period of optimal development, stimulation is needed that can increase brain capacity. Children's physical motor skills must be considered because they stimulate gross muscles and affect children's cognitive abilities. The researchers discovered that there are parts of the brain that process movement that are the same as parts of the brain that process learning. Children can learn best when they are active because they stimulate neurons that facilitate the child's ability to obtain information and learn [7].

Nowadays the new learning paradigm is what is called Brain based Learning (BBL), namely managing learning based on brain abilities which involves full learning, where learning patterns are changed from relaxed to active learning patterns so that each node in the brain can play its respective role. -each in its entirety. It is believed by many parties that this learning model directly plays a role in the brain enrichment process. In 1970, Paul Mc.Clean began to introduce the concept of Triune

theory, which refers to the evolutionary process of three parts of the human brain. In his hypothesis, Mc.Clean states that the human brain consists of three important parts: the cerebrum (neocortex), the midbrain (limbic system), and the cerebellum (reptilian brain) with their respective distinctive and unique functions. The cerebrum (neocortex) has the main function of language, thinking, learning, solving problems, planning and creating. Then, the midbrain (limbic system) functions for social, emotional interactions and long-term memory. Herman said that the cerebellum (reptile brain) itself has the function of reacting, instinctive, repeating, self-defending and ritualistic [8].

Brain-based learning explains the importance of the individual as someone who learns and the individual as a translator of meaning and decision maker in the learning process, whether the knowledge being translated is irrational and logical, or influenced by social and cultural factors that shape that knowledge according to their interpretation of existing experience, previous experience. and other influences.

Brain based teaching and learning offers a concept for creating learning oriented towards empowering students' brain potential. There are three strategies that can be developed in implementing brain based learning. First, create a learning environment that challenges students' thinking abilities. In every learning activity, teachers often provide questions that are packaged as variedly and attractively as possible. These questions facilitate students' thinking abilities from the knowledge stage to the evaluation stage according to stages

Thinking based on Bloom's taxonomy. Second, create a fun learning environment. Howard Gardner in the book quantum learning by De Porter, Bobbi, & Mike Hernacki states that a person will learn to the best of his ability if he likes what he is learning and he will feel happy being involved in it. Third, creating an active and meaningful situation for students (active learning). Students are stimulated through learning activities to be able to build their knowledge through an active learning process.

Apart from planning and structuring classrooms, the learning and assessment process also does not reflect brain-based learning. According to Joyce & Weil (In Nuangchalerm, 2010) brain-based learning, in the learning process there are five learning steps, namely (1) Preparation (preparation), (2) Relaxation (relaxation), (3) Action (action), (4) Discussion (discussion), and (5) Application (application).

In brain-based learning, according to Jensen (2008) you must pay attention to (1) the classroom setting as a learning environment. (2) how the brain works. (3) Learning always includes conscious and unconscious processes. (4) Motivation to learn. (5) The uniqueness of the brain. (6) Different ways of learning for children.

In developing early childhood intelligence, early childhood education activities should pay attention to 9 children's learning abilities which include: 1) Linguistic intelligence which can develop when stimulated through speaking, listening, reading, writing, discussing and telling stories. 2) Logical-mathematical intelligence (logico mathematical

intelligence) which can be stimulated through counting activities, distinguishing shapes, analyzing data and playing with objects. 3) Visual-spatial intelligence

can be stimulated through playing with blocks and geometric shapes completing puzzles, drawing, painting, watching films or playing with imagination. 4) Musical intelligence (musical/thythmic intelligence) which can be stimulated through rhythm, pitch, time, various sounds and clapping. 5) Kinesthetic intelligence (bodily/linesthetic intelligence) which can be stimulated through movement, dance, sports and especially body movement. 6) Naturalist intelligence, namely loving the beauty of nature, which can be stimulated through observing the environment, farming, raising animals, including observing natural phenomena such as rain, wind, rainbows, day and night, heat and cold, the sun and the moon. 7) Interpersonal intelligence (interpersonal intelligence), namely the ability to make relationships between people (friends) which can be stimulated through playing with friends, working together, role playing, and solving problems.

problems, and resolve conflicts. 8) Intrapersonal intelligence (intrapersonal intelligence), namely

the ability to understand oneself which can be stimulated through developing self-concept, self-esteem, knowing oneself, including self-control and discipline. 9) Spiritual intelligence, namely the ability to know and love God, which can be stimulated through the cultivation of moral and religious values (Directorate of Early Childhood Education, Directorate General of Non-Formal and Informal Education, Department of National Education, 2009)

Each child's development is different, some are fast, some are slow, depending on talent and environmental factors, therefore treatment of children cannot be generalized, it is best to take into account the child's growth and development level. Conny Semiawan describes the characteristics of early childhood thinking in accordance with Piaget's theory, namely: 1) Thinking concretely, 2) Realism, 3) Egocentrism, 4) Tendency to think, 5) Animism, 6) Centration and 7) Having a clear imagination. very rich [9]

Children as individual and social creatures have the right to receive education that suits their needs and abilities. With the education provided, it is hoped that children will grow and develop intelligently according to their potential, so that in the future they can become quality children of the nation. On this basis, Early Childhood Education aims to produce intelligent generations from an early age. Because, early age is the most appropriate time to develop a person's character. If during this period the character of each child is successfully formed, then in adulthood they will become a generation with strong character. Because, 80% of his character has been ingrained to be good. This is why the existence of PAUD is a necessity.

By knowing the brain development of early childhood, learning in PAUD should be brain-friendly. The very rapid

condition of children's brain development requires complex stimulation. The stimulation provided will accelerate the development of brain fibers in children. The more complex the stimulation, the more rapidly the child's brain fiber will develop.

At preschool age, a child's brain as a learner has been formed by receiving many influences from the environment, including the home environment and the playground environment. According to Jensen, there are seven things that influence learning, namely: 1) genes, 2) nutrition, 3) nature and temperament, 4) experience, 5) pre-learning, 6) brain dysfunction, and 7) friends [10]. Enjoyable experiences stimulate the release of chemicals (neurotransmitters) that can foster learning experiences. This is in line with what Chamidiyah said, which stated that the brain's adaptation to environmental stimuli can cause "dendritic sprouting", so that the more environmental stimuli a child is given, the smarter the child will be [5].

Role playing activities and games in PAUD are one example of learning activities in PAUD which provide the brain with the opportunity to create more complex perceptual maps [10]. These activities have a high tendency to involve emotions. If the focus of the activity is more on what is shown rather than learning, then it is possible that stress can be reduced and children's creativity will increase. Therefore, knowledge depends on conditions. What children learn during role-playing activities may be accessible in similar situations at a later date.

Brain-friendly and neuroscience-based learning media in PAUD must be rich in visualization, imagination, association, art and expression. Drawing and coloring activities which are often carried out in PAUD are also included, however, they must be accompanied by enriched objects so that they contain imaginative and expressive elements. The most important thing in brain-based learning for PAUD is that learning must be made meaningful and fun. Learning activities provide more choices and develop the creativity of young children as well minimize evaluative pressure.

The collaborative learning method is one of the learning models used in PAUD, this method teaches students to care about each other. The definition of collaborative learning is referred to using the phrase collaborative learning which is deliberately designed and implemented in pairs or small groups, although in fact a flexible definition of collaborative learning is the best, there are several flexibilities which are considered important, namely: 1) Collaborative learning is a deliberate design, 2) Cooperation and 3) Collaborative learning is a meaningful learning process. Another definition that explains the meaning of collaborative learning is a learning method that applies a new paradigm in learning theories, especially constructivist learning.

Based on the explanation above, it can be concluded that collaborative learning is learning that is deliberately designed by teachers, in the form of designing group work activities so that students can work together so that a meaningful learning process occurs. Collaborative Learning is a teaching and learning process that uses small groups that allow students to work together and benefit each other.

When a child reaches the age of 3 years, his brain cells have formed around 1,000 trillion connections/synapses. This amount is 2 times more than that of adults. The brain cell itself can communicate with 15,000 other cells. Synapses that are frequently used will become stronger and more permanent. In this case, every stimulus or stimulation that children receive in PAUD learning will create new connections and strengthen existing ones

We often find the intended stimuli in PAUD. Therefore, PAUD is very important for providing children's brain stimulation. Lack of stimulation will later cause the child's brain development to be less than optimal. Apart from that, the stimulation given to children through PAUD institutions will make neuron functions work optimally, making it useful for developing children's sensory abilities.

Rushton, Juola-Rushton, & Larkin explained that one of the basic principles of a learning environment that supports optimal brain stimulation is to provide diverse learning opportunities in the classroom, for example with a computer area, writing training laboratory, science area, materials. to play a drama [11]. Providing diverse learning opportunities in classrooms can also be facilitated in learning centers. With a learning center, children can channel their individual interests, find out something they really want to know, and can facilitate the potential that each child [12].

So that education in PAUD can run optimally, on target, and in accordance with targets and objectives, appropriate learning strategies must be developed, one of which is the brain-based learning approach. Therefore, to optimize early childhood education, educators and parents must be able to adapt to the principles of brain-based learning. Below we will present several efforts made by educators to optimize PAUD through brain-based learning, which is appropriate to children's development (developmentally appropriate practices), namely creating a learning environment that can make children engrossed in the learning experience, namely by involving all physiological aspects of children and providing diverse learning opportunities in the classroom and creating an active learning environment [13].

IV. CONCLUSION AND RECOMMENDATION

A. Conclusion

Early childhood children have the right to education, as stated in Law no. 20 of 2003 concerning National Education chapter 1, article 1, point 14 which states that Early Childhood Education is a coaching effort aimed at children from birth to 6 years of age which is carried out through providing educational stimuli to help physical and spiritual growth and development so that children have readiness to enter further education.

Neuroscience is a science that studies the nervous system of the human brain. Neuroscience also studies consciousness and brain sensitivity in terms of biology, perception, memory, and its relationship to learning. Efforts to optimize the achievement of learning outcomes for young children go through several stages, including the following: 1) It is hoped that parents and PAUD teachers will be wise in providing various stimulants. During this period, children are not only given experience but more importantly facilitated and stimulated to optimize the development of their intelligence capacity; 2) The potential for intelligence develops rapidly if parents, teachers and the environment understand neuroscience and provide optimal stimulants that can influence the quality of children and monitor the process of developing children's abilities; 3) experts advise parents to encourage students to take part in musical arts activities, because musical arts can stimulate the brain, improve social skills, increase feelings of empathy, and so on.

The learning process in PAUD occurs continuously over time and is carried out repeatedly. A brain-friendly curriculum must contain integrated and interdisciplinary learning that can provide a variety of activity choices for young children. Brain-based learning can accommodate individual learning styles. In this learning concept, the learning process runs according to the way the brain functions. The brain functions to store all the learning that occurs within each person. Early childhood educators in this case have an important role in providing an appropriate environment to encourage the learning process to run optimally and effectively according to the way the brain learns.

The principles of brain-based learning that can be applied in PAUD include: 1) creating a fun learning environment and providing learning experiences for children, 2) providing a variety of activity choices and demanding children's creativity, 3) creating an active learning environment, 4) creating a learning atmosphere that is free from pressure, but still has elements of challenge so that it raises children's curiosity, 5) creating an integrated curriculum and 6) involving children in concrete experiences in problem solving efforts.

Indonesia is ranked 65th out of 130 countries in the world, which is a special PR for the Indonesian government. Looking at Singapore with rank 11 as the best country, followed by Japan with rank 17 and South Korea with rank 2. This means that all three are countries in East Asia that are committed to increasing human potential through education. So at least Indonesia is one of the countries that is less effective in the context of education

B. Recommendations

As we know, Singapore is superior in many things, especially its education system. However, without us realizing it, Singapore also has weaknesses in terms of human resources. And HR or human resources are only able to follow the system and run it. But they don't have the courage to say what is right or wrong. This means that they are slightly inferior to developing nations in terms of creativity, including Indonesia. It is hoped that the Indonesian Government will pay close attention to the needs of students so that the implemented curriculum adapts to how to shape children's character. because children who have good personality traits show that the education provided is said to be successful.

Implementation of neuroscience research results in basic education involves neuroscience, cognitive neuroscience, psychology, educational theory, and learning practices. It is hoped that the learning concept from a neuroscience perspective is learning that empowers the brain's abilities according to its stage of development and optimizes brain performance through creating a learning environment that is challenging, fun, meaningful, and encourages students to be active.

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