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Introducing STEAM (Science Technology Engineering Arts and Math) Through Creative Exercise to Stimulate a Child'S Creativity and Motoric Senses in an Urban Environment

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Introducing STEAM (Science Technology Engineering Arts and Math) Through Creative Exercise to Stimulate a Child's Creativity and Motoric Senses in an Urban Environment

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ABSTRACT

The stimulation of a child motoric senses during their early childhood is very important in impacting their future developments. The golden age of a child's growth is between the age of 0 - 5 years. At this golden age, parents and teachers have a very important role in their development. Engaging a child interest in STEAM since early childhood would be beneficial in critical thinking, problem solving, creativity and innovation, communication, and collaboration skills. Playing as a form of creative activity can help to develop children's intelligence and emotional levels, this can also be done in their daily activities by including art and craft activities.

Keywords: *STEAM, Playing, DIY, art and craft, toy, activities, exploration*

1. INTRODUCTION

Munandar, Utami S.C says that a child's development process which is a role as much as 70% to 80%, occurs from the the age of 3 years (*Aspek Psikologi dan Penerapannya, Analisis Pendidikan Departemen P&K, (Jakarta:Balai Pustaka, 1981), 69).* At this age, a child accepts and absorbs a lot of things that happen during their growth and development. It doesn't mean that the age after golden age (0-5 years) is not important, it's just that what they receive in this phase is a series of firsts, much more recorded and can be the basis or foundation in their future development.

In research done by neurologists, the addition of new neuron cells will continue to occur and develop rapidly in a child up to the age of 4-5. The developments that must be considered are the form of physical development, fine and gross motoric skills, verbal skills

and social skills development. The brain development occurs in the whole hemisphere of the brain, where the different abilities of a child is stored in both the right and left hemispheres. The left hemisphere of the brain is related to the right hand, foot and body. These controls the activities that are regular, detailed, sequential, constant and systematic. For example, counting, reading and writing. While the right hemisphere of the brain is more associated with the hands, feet and left limbs. It is also responsible for controlling a lot of activities that are broad and imaginative, such as things that are related to creativity, music, intuition, emotions, the formation of ideas, both abstract and simultaneous.

Why is motoric skill development essential? The motor skills development deals with the manipulation of manual objects, such as writing, weaving ropes, arranging beams, tying shoelaces, flipping pages of books, cutting with scissors, playing dough, and making shapes from folding paper (Amel E Abdel Karim, 2015) In addition, fine motor skills can be activities such as cutting with scissors, coloring, drawing with pencils and crayons. A research shows that clinicians underscore the critical importance of motor skills to kindergarten preparedness. The link between motor skills and early math skills completely explained any influence attributed to verbal skills (Pagani & Messier, 2012).

STEAM (Science, Technology, Engineering, Arts and Math) is a developing educational model of how the traditional academic subjects of science, technology, engineering, arts and mathematics can be structured into a framework by which to plan an integrated curriculum. It includes reviews of the epistemologies of general and discipline specific developments in conjunction with the individual discipline's standards, as related to integrative, or holistic, education (Yakman, 2002). Investigating these educational relationships to one another is currently being explored as a way to find the commons of education in relation to pedagogy and language As Albert Einstein said, "Imagination is more important than knowledge." Through imagination, children can see the world largely. Imagination is the door to all possibilities. It will stimulate children to think creatively, both creatively in creativity and even creatively in solving a problem. Imagination and creativity are one of the ways how children see the world. Creative is a process where we could explore something (material) and to find or create something (object).

Socrates and Aristotle are credited with the concept that the 'pursuit of knowledge is the highest good' and that this is the basis of education (Ulich, 1947) Therefore introducing and starting a child knowledge on STEAM since early childhood would give them an advantage over other children who are not introduced to STEAM from a young age.

Innovation is simultaneously reflected in the variety and diversity of art. Over the past century, art forms have progressed along a continuum from static to dynamic, and then to interactive and participatory. The therapeutic value of creating and engaging in all of these

art forms has also been identified. Furthermore, educators have recognized the profound value of art and design within the context of scientific and technical learning, and STEAM (science, technology, engineering, art, and math) has emerged as an educational philosophy with a strong base of support (Kamienski ,2018)

Why is STEAM gaining traction? It is said that creativity is at the center of the future economic drive, this is shown in Indonesia by the President himself, our President, Mr Joko Widodo said, “The era of the creative economy must be to support the Indonesian economy”. As it is growing rapidly now is the number of creative industries that have sprung up in all sectors such as art, culinary, product design, music, market-place, transportation, event organizer, etc. According to a kompasiana article, in 2030 the productive age is predicted to be around 60% of Indonesia populations, and 27% of them will be youngster from the age of 16 to 30 years old. It is stated that that a class with a creative based approach would foster more creative alumni that is more successful than their other peers that are not in a creative environment (Wardani, 2017)

2. METHOD

This study uses the Regio Emillia Approach (REA) methodology where learning is seen as a journey and education as an effort to build relationships with people and create relationships between ideas and the environment. Project activities that the children can do in the form of ideas that emerge from the children themselves, ideas that are provoked by the teacher, the teacher can introduce what is interesting to discuss, develop ideas and all project activities must be in accordance with reality.

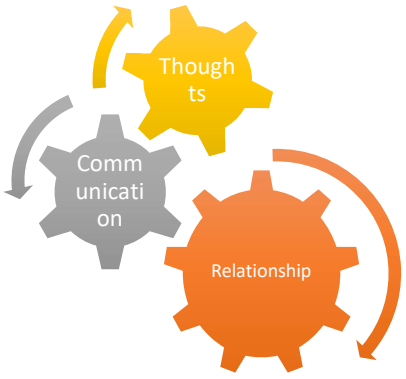

Figure 1 Regio Emillia Approach (REA) methodology

The approach that see's the learning objectives to communicate the children's ideas and rights, potentials and resources that are sometimes overlooked by others, to promote the study and research, to do experiments in learning with an active, constructive and creative learning experience and to increase teacher professionalism. This would also support a high awareness in the values of cooperation and the meaningful relationship between children and their families. Giving value to the research, observation, interpretation and documentation of knowledge that is built from a child's thought process. Going out to guided visits of an educational program, cultural exhibitions, seminars and courses in early childhood education and culture issues.

To do this, the first observation to be made is the children themselves. Observations made were the children's behavior in playing during arts and craft activities in an urban environment, which is PAUD Al Hidayah Pertiwi in Kelapa Gading Jakarta. By observing their habits, gestures of the children, the way they communicate, and how they interact when alone or in groups. Then the following observations made on the object made by the children during the activity. The materials used are simple such as clay, plastic spoons and wires. How the children develop and play with it, and how they tell the story of what they have made, The process of combining the materials and how they learn about the materials, the process of making it into a tangible object.

3. RESULT AND DISCUSSION

Children always have a high curiosity. What they see around them can be an inspiration that is outside of our habits in understanding an object. Their imagination is very broad and unlimited. Like the research that has been done by NASA about Creativity Scores at Genius Level. The results were astounding. The proportion of people who scored at the 'Genius Level', were among 5 years olds are 98%; 10 year olds are 30%; 15 year olds are 12%; and same test given to 280,000 adults at average age of 31 is 2% only.

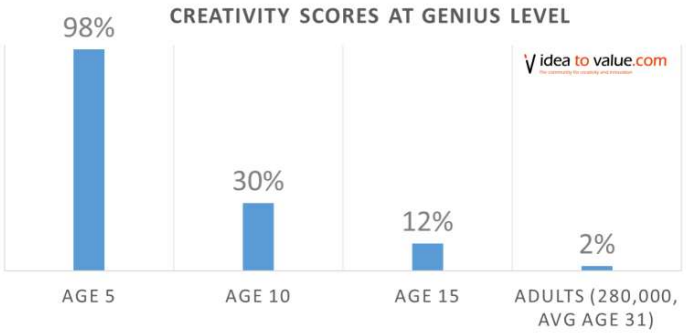

Figure 2 Creativity Scores At Genius Level Research Chart by NASA (Source: ideatovalue.com)

“The surrounding environment is one of the factors that can affect a child’s creativity. How a child would they feel, what they see, what they taste, what they smell and hear through their five senses from the surrounding environment accelerates the development of the connecting nodes that exists in their brain. When a child is happy doing something, the pathway of the brain cell connection will grow rapidly and is easier to remember” (Angelina, 2018). Providing opportunities for creativity is as easy as providing paper for drawing, spoons for tapping on a bucket and forming a rhythm. When children say "Look, I made this picture!" As a facilitator it is best to respond with "Can you tell me about your drawing?" A response like this would give the child an opportunity to tell their imagination through a picture, where they would try to communicate something using their hands through an image on paper. By using this open and free communication there is no right or wrong in how they would tell their story.

3.1. STEAM Activity

STEAM stands for Science, Technology, Engineering, Art, and Math. Each of STEAM’s five subjects share a common approach and focus. They require gathering and using evidence to create knowledge or solve problems. The learning process happens naturally everyday as children explore, play, and try new things. When young children have the opportunity to investigate the world around them, they learn and experiment with new skills and theories.

The process of STEAM learning begins early. But it isn’t about showing an infant or toddler flashcards or teaching equations. It is the hands-on things that children do everyday. This learning process includes examining shapes, building forts from cardboard boxes, playing “grocery store,” pouring liquids and other materials, filling and emptying containers of different sizes, and mixing paints to create new colors. And these are only a few examples. Many of children’s everyday activities use STEAM skills, even if we don’t typically think of them in that way.When children play, they explore and build skills and theories about the world. When young children investigate their environment, they experience the satisfaction that can come from investigation, discovery, and solving problems. Adults can foster children’s development of STEAM skills by providing learning opportunities and materials that support exploration and discovery.

3.2. Using Pop Culture

Within dramatic play, language become more clear and natural, allowing children to connect with more fluency and curiosity, the words and phrases they know to new ideas. (Paley, 2004). She also explains that "fantasy play is the glue that binds together all other

pursuits, including the early teaching of reading and writing skills (p.8)". Therefore, using characters that are of interest to the children would motivate them to interact and play which in turn would lead them to learning new things. There have been many studies that corroborates that using pop culture would be beneficial in a classroom to make children more interested in learning (Fukunaga, 2006). The results outlined in the article have a potential to further motivate students towards learning English as well as improve their communicative and socio-cultural competences.

For this study, the character of Forky from the movie Toy Story 4 is used as a basis to introduce kindergarten level children to STEAM.

Figure 3 Forky from Toy Story 4 (Disney/Pixar)

Forky is a white plastic spork outfitted with a pair of different sized googly eyes, a mouth made out of blue plasticine, two halves of a popsicle stick for a pair of feet held together by bubble gum, arms and hands made out of a red pipe cleaner, and a unibrow made out of red plasticine. Bonnie's name is written on the bottom of his feet. Why was this character chosen as the subject for the study? Because in the movie itself, the character is made by a child in the setting of a class room. This alone struck a chord with the kindergarten children who saw him in theaters. The character is also chosen because of the ease of material availability and in accordance with the STEAM principle, there are many educational values that can be extracted from this character alone.

4. Using Simple Toy Making to Introduce STEAM to Kindergarten Children

By using the character Forky, the writer as the facilitator at PAUD Al Hidayah gives simple STEAM practices to the kindergarten children. Looking at the character, the five branch of STEAM can be easily introduced by breaking down the character into each aspect of STEAM which is:

- Science: Introducing the basic material knowledge, what Forky is made out of, how his body is made from plastic, what his hands and foot are made out of.
- Technology: telling a story how each part of Forky is made.
- Engineering: How Forky is constructed. How to attach his eyes using glue, how the hands are attached, and how to construct the feet and attach it to his body.
- Arts: Choosing the colours, how each individual child have the freedom to express how their own interpretation of Forky would look like.
- Math: Simple counting of how many individual pieces are needed to make up Forky. How many eyes he has, how many hands, how many feet he has.

By engaging the children through a character that they know, the children are more enthusiastic in following the art and crafts program. This process of simple toy making also helps them to improve their motoric skills. The areas thet the writer hopes to be improved are the dexterity of their fingers in manipulating small objects, how the children manipulate the pipe cleaners into the shape of Forky's hand. And also looking at how the children would go beyond the basic design of the character.

Figure 4 Kindergarten children at PAUD Al Hidayah making the toy

Figure 5 The interpretation of the character made by the childrens

5. CONCLUSION

There are many things that can be obtained from the exploration of creativity through playing and art activities such as artistic creativity, academic & cognitive activities in terms of thinking, processing, problem solving, and seeing the possibilities that can occur; and the development of the motoric senses of the child. From not being able to handle small objects, to being able to handle and manipulate small objects that require the dexterity of their fingers. The childrens imaginations are also stimulated, this shows when they tell the story of their own version of the character. Why they picked the colours for it, and how it looks.

Figure 6 The children explaining the story of their own toy

Why is the having an advantage in STEAM and having good development of motoric skills important? Because studies have shown that with the increase of motoric skills, the development of the cognitive ability in a child would be better than a child who have poor motoric skills, and by having been exposed to STEAM at an early age, the child would have an advantage from those that are not exposed. The simple answer is being a creative person opens up unlimited potential. With the push for creative economy, the urban society must

adapt and change how the current curriculum into a creative based curriculum that incorporates all elements of science, technology, engineering, art and math.

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