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Implementation of Free Play Activities Based on STEM Education to Enhance Creativity Among Indigenous Pre-schoolers

Komalah Apu[1] & Mohd Nazri Abdul Rahman[1]
Faculty of Education
University of Malaya

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Abstract

This paper highlights the about free play and its activities based on STEM education. The aim of this study is to educate our Malaysian indigenous children with STEM approaches and to be part of our Malaysian education 60:40 policies. Around 25 children and 5 teachers have been participated in this study. Free play is a type of play where teacher provides material for the children to use depending on their thoughts or ideas while playing. Teachers' play role as their playmate and provide little guidance for children on how to play the activities to avoid repetitive. By engaging in free play activities, young children can learn to be independent, observe, make decision on their own and solve the problem that may occur during play. Integrating STEM in early childhood is a new concept in education where it more focuses on intellectual learning instead of academic learning. Therefore, these free play STEM activities are crucial for young children since they are in the stage of exploring and testing theories on how the world works as well as developing their brains to be STEM thinkers. This study showed that free play could be one of the best ways to use in STEM education. The finding s showed that the children were able to explore the given material and develop unique ideas on how to manipulate the material and overcome the problems creatively. Free play also fosters their social and language skill as they played in a group. When young children can communicate well, they would be able to share their thoughts, new words and adapt to the environment. This led to the children becoming more self-regulating. The only challenge that occurred during this study was lack of time as the children were overjoyed with this type of play and did not want to stop playing.

Keywords*:* Indigenous, Free Play, STEM Education, Early Childhood Education

Introduction

According to many researchers, indigenous peoples living cost still below poverty level (Harun & Idris, 2012). It is included their living styles and education as well. Although Malaysian government have taken various steps to overcome the issue, but still majority indigenous peoples' quality of life become a question mark where in a study to measure the Quality of Life Index Indigenous people (IKHOAW), shows the indigenous peoples' quality life is unsatisfactory. The study is measured from different aspects of life such as having good health, good communication level between local public and their ability to get along with local societies. Even though, government always helps indigenous people with building houses, giving water and electric supply to bring up their quality living lifestyle, encouraging and giving chances to change indigenous peoples' lifestyle through education would be a great step where this effort can bring a life changing and better future in indigenous generation where it can enhance their quality of life by generation (Ramlah, J. & Aslina, A, 2013). In past research, indigenous peoples' problems were stated such as lack of interest in schooling as they need to travel far to go to school, poverty, living style, cultural differences, parents' involvement, lack of teachers who could understand their culture, attitudes and school administration (Nicholas, 2006; Kamaruddin & Jusoh, 2008; Sharifah et al., 2011; Asri, M., 2012; Ramle, Wan Hasmah, Amir Zal & Asmawi, 2013; Ramlee, 2013). It is always being Malaysian government, Ministry of Education (MOE) responsibilities to minimize educational gap between indigenous students and local students by introducing new policies and approaches to update and encourage indigenous children interest in learning and be update to current education system.

As well as we know, STEM education is a new approach had been introduced in year 2013, with the aim of to produce highly intellectual generation in 2020. STEM education enables the four major subjects in education program break the traditional thoughts and combine under one line of program, so every student can experience this field from the early stage of school which may change the children interest and mold them into STEM young scientist, technologist, engineer, arts or mathematician. United States of America is the first country who has begun with STEM approach in early 90s (Koehler, Binns & Bloom, 2016). Since year 2013, STEM has become a huge highlight in United States of America and most of the Europe countries after President of Unites States of America, Barack Obama, indicates that our children are naturally born as an explorer and scientist where they always teach us something beyond the specific topic and how to question assumptions, why somethings works in this way and how to make it better (NSTC, 2013). Besides, our young child always reminds us that curiosity, questioning, learning, discovering and imagining is always the way to learn and discover something new which will never be late at any age. This means, by giving a strong basement during their early years of education by integrating STEM education, we may produce a highly intellectual with 21st century skilled generations in next twenty years which means with new generation capable of building relationships with others to pose and solve their problems collaboratively and cross-culturally, generation with proficiency in design and share information for global communities to meet variety proposes, well efficient to manage, analyze and synthesize multiple simultaneous information, highly competency to create, critique, analyze and evaluate multimedia text and ability to the ethical responsibilities required in complex environments.

This article will be focus on free play and STEM related activities that has been carried on in national preschool for indigenous children. According to Brussoni, Olsen, Pike & Sleet (2012), free play is natural way of playing whereas it does not follow any instructions, instrumental and guided by teacher. Besides, it is a play where children make decision on what they want to play, how they want to play and when they need to stop playing and move on other attempts. Moreover, pediatricians have emphasizing free play as an essential and healthy part of childhood where

children learn to be flexible, to develop in term of social, emotional, intellectual and would be able to manage stress when they play freely. Free play has an important role in developing children's creativity during their preschool age when children able to combine objects and ideas freely during play, it generates the process of creative thinking. Pretending to be someone or something is during free play enables children to extend their imagination level without boundaries. This is an open-ended process where children could improve their creative thinking skills and could be a best approach to implement STEM in preschool education. Children may not understand STEM by explain in word about the term of science, technology, engineering and mathematics but they can get an idea about STEM when they touch, explore, experiment, play and manipulate with the provided material. Furthermore, according to Malaysia Education Director, Datuk Dr. Azmin Senin, Malaysian National Education need to focus of STEM education in early year setting and schools to ensure having a society engaged and high skilled workforce in year 2020 (NSTP, 2018). Additionally, he also mentioned that STEM education begins in early childhood where through their play experience and family environment, children could engage with the way that could promote STEM experience through exploring hands on multisensory and creative experience. This is way to encourage and develop curiosity, inquisitiveness, critical thinking, divergent thinking and problem-solving skills during their early years. Therefore, integrating free play activity in STEM education is an essential way to implementing science and mathematics-based education in preschool level because, children could have better understand and generate ideas when they able to access freely by touch, feel and explore as well on any material based on certain topic rather than explanation by words and guiding them during play session.

Statement of Problem

STEM education is a new approach in Malaysian education system which is parallel curriculum for entire country. In 2017, our government had announced reformed curriculum National Preschool Curriculum Standard (KSPK). The purpose of this reformation is to produce 21st century skilled generation start from early years to future where they will be more advance than others. Our government has started to implement STEM education in school level and need to make sure that this approach are has fulfil the requirement of the STEM education. The idea and the features of STEM that has been presented by researchers are clear and good, but issues occur at the stage of implementation of STEM in curriculum. Is the approach has been successfully executed in preschool curriculum?

According to Roehrig, et al. (2012), United States of America faced some big issues during implementation of STEM in their national curriculum for some concrete reason which is, lack of teacher's knowledge on the field, lack of professional training for teachers and lack of proper guidelines about the approach in syllabus. Somehow, Malaysia is facing the same issues in implementing STEM approach in our preschool curriculum where, our teachers are less exposed to this approach because it is newly implemented without proper guidelines. Furthermore, teachers who teach science and mathematics could not adapt to science related field of engineering because lack of knowledge and experience in this subject area. Therefore, Malaysia need to reinforce, improve and monitor to establish a competent teacher in term of knowledge, skills and attitudes within the context of integration of STEM. Malaysia Education Blueprint 2013-2025 become an important document for all interested parties in the field of education in Malaysia (Bahrum S., Wahid N., Ibrahim N., 2017).

National Constitution Malaysia does not specifically state the Rights of Indigenous People Education, but through the provisions of Act 134 (indigenous people 1954 amendment 1974: Article 17) stressed that not an indigenous people child can be prevented from studying in any

school. The right of education is further strengthened through the Education Act 1996 (Act 550) and Selected Regulations (up to 15th December 2003) which is amended to make basic primary education is compulsory and free. This means that every child aged 6 years up to 12 years must follow compulsory schooling (primary school): School Education low mandatory (amendment of section 29a). This amendment is in accordance with the Rights Convention Children 1989 (CROC, 1990) and the Universal Declaration of Human Rights (UNDHR, 1948). The issue, this amendment implies a huge impact on the community indigenous people because not all indigenous people children are educated on a regular basis formal at school. In addition, there is also an issue of literacy and numeracy levels 10 low among indigenous people children and the rate of drop in children indigenous people from mainstream schooling is still too high compared to the average nationality. Although our Malaysian government always encourage indigenous children and family to send to school to overcome dropout issue, failure in implementation inappropriate school policies according to indigenous lifestyle lead to increases numbers of dropout students.

Research Question

1. How could free play activities based on STEM education could increase creativity among indigenous preschool students?

Literature Review

STEM Education

Minister of Education (MOE) in Malaysia reviewing the curriculum is to upgrade our education standard up to international level in year 2020 because the 60:40 policy that has been implemented since 1970 has not been achieved its purpose. This policy aim is to be placing 60 percentage of students in science stream and balance 40 percentage in arts stream but currently only 42 percentage of upper secondary students are in science stream (MOE, 2016). However, MOE continue pursuing this idea which contribute to STEM education for all level. Therefore, MOE in the process of preparing our students to fill STEM requirement, so they could face challenges in future world and would be able to meet the requirement of employment by mastering STEM fields. MOE introduced Enhancing STEM Education through the Malaysian Education Blueprint 2013 – 2025 as an initiative to encourage children to venture into STEM secondary level and tertiary education in 2013. Emphasizing STEM at preschool level is contained within the National Preschool Curriculum (NPC). NPC emphasis on the acquisition of fundamental skills in STEM which is scientific skills through its two element which can be early science and early mathematics. In early science children discover nature and the world around them, engage in inquiry learning and acquire basic process skills which is include observing, evaluating and grouping within the process. In early mathematics, children are exposed to number sense, early numeracy activities and easy problem-solving activities meanwhile, methods of delivery consist of thematic learning, play based learning as well as inquiry-based learning (Edy Hafizan, Ihsan Ismail, Lilia Halim, 2017).

Free Play and National Standard Preschool Curriculum

Free play is a component of the revised National Standard Preschool Curriculum (NSPC) 2017. 60 minutes a week has been allocated for free play. Teachers can carry out 20 minutes activities 3 days a week or half-hour activities twice a week. The purpose of free play in NSPC is to inspire preschoolers to interact and explore with nature other than cultivating energetic and healthy lifestyle. According to NSPC free play needs to be carried out outdoor. Free play activities can be

carried out in four different methods wherein the primary approach is children are given the materials and equipment to play with and they come up with their own game. Secondly, kids can use the materials around them to play creatively. Apart from that, children can also be given an opportunity to play in a playground. NSPC also encourages youngsters to play without any materials. Ultimately through this approach children are given free space and opportunities to create, develop and enjoy their own play and imagination. Though children are the primary executor of free play, teachers do play an important role in the success of free play. According to NSPC teachers need to set proper area and boundary for kids to play aside from ensuring their safety. Apart from that, teachers need to facilitate the activities while carrying out assessment via observation.

Why Free Play is Important?

Free play is a platform for the children to express their feelings and emotions in a very positive way and opportunities to explore materials and discover their properties through free play. Apart from that it is a unique way to encourage children to maintain in term of physical, emotional and mental health and well behavior. Children also develop self-realization, self-esteem and self-confidence through free play where they learn and love about their self on likes and dislikes and abilities in different situation. Besides, theorist hypothesized that when a child surrounded with positive effects, it could increase creativity as it primes and broadens the associative process as well. During play, children exercise many skills which can be essential for overall development begin from childhood such as physical and manual skills, intellectual abilities, and social talents (Adrian Voce, 2017). Here children discover ways to manage and overcome their fear, anger and the way to handle emotion in life threatening situations. For example, children love to play in emotionally exciting methods such as being tossed into the air. However, the height of the tosses and the energy of the swinging will be determined by the child themselves. They usually begin at low heights or gradual speeds and move progressively up. They take risks carefully. The pleasure of play blended with a little worry feeling is the superb sensation all of us to experience the thrill in the game.

In addition, free play generates divergent thinking skills which is an important component to produce creativity. This skill generates varieties of ideas to solve one problem that occurs during play (Russ, 2014). For examples, when to move uneven block toy from one place to other place, enables children to think how to balance the block, how to move in easier way and how many people are require solving this problem without any damage. Children could move by using other object with wheels as base, few pupils to balance each side, and few to check object moving without changing shape of the object. In a longitudinal study by (Acar, S., & Runco. M.A, 2011), strengthen his conclusion that the ability to think divergently during childhood predicts their creativity in adulthood by using Torrance Test of Creative Thinking. Through free play children could develop their divergent thinking skill because free play is a platform for children to enhance their creativity and problem-solving skills without interrupted by adults and break the myth that creativity comes by birth (Plucker J. A., & Runco M.A, 2011). Besides, it is important nurturing divergent thinking skills since early years where it would be crucial element in STEM education, and which could produce creative person during their adulthood.

Furthermore, decision making in free play enable children able to select where they would like to play and with what props they like to play (Bruce T, 2011). Automatically children able develop and improve their decision-making skills by practice. Children could discover choices may lead to results and face the consequences based on their decision. It helps children to realize the reality which would practice them to lead a life as growing. Meanwhile, physical well-being indicate outdoor activities enables every child gives opportunities to run around and build up their

physical abilities. They will be able to develop their motor planning skills whereby this skill helps the children to create and carry out ideas, motor actions and activities (Jeffery Goldstein, 2012). Besides this is a great opportunity for children who prefer to be outdoor and this would be a great challenge to teachers who might want to replicate their indoor activities in outdoor. In the study by Sue McCleaf (2012), when children learn in different environments, children would explore, experience new opportunities by discovering the differences of playing indoor and outdoor as well. Additionally, developing social skill and collaborative play skill assures children to develop problem solving skill and learn to take turns. Free play also helps children to develop their leadership skill when they lead a group and they understand their task as followers. Unfortunately, we live in a generation where a hurried lifestyle, modifications in family structure, and extended attention to teachers at the cost of recess or free child-oriented play lower the child's possibility to achieve the benefits of free play. Children should have more time for play freely instead of pressuring them into enrichment activities and extra classes. A lifestyle without play can be the major cause of stress, anxiety, and may lead to mental depression (Karen Sue Sussman, 2012). The authors and researchers conclude that free play is essential in psychological development and it protects emotional development too.

Methodology

This is an experimental study that conducted to evaluate the development of creative skill among indigenous children through free play activities based on STEM approach. Besides, this study also investigates the importance of free play in early childhood education system in future Malaysian curriculum. Observation and interview method are used to collect data.

Procedure of the study

Material

Children were allocated with an empty place at outside of the school with measurement of 29 * 10 feet was arranged with some play materials to be use in this activity. Total five categories of material have been prepared for children to play. The materials in first category is jar, warm water, ice cubes and aerosol deodorant spray for cloud in a jar activity. Meanwhile in second category, cartoon toys, white cardboard and phone for create stop motion animation. Third activity materials are, ice cream stick, rubber band, cardboards, hot glue gun and small bottle lid for craft stick catapult. Forth materials are, mahjong paper, watercolor with water, palette and brushes, magic colors, crayons, tray with water and sponge and plastic sheet for colors activities. Fifth materials are, paper, coins and pegs for coin value clip card. Five stations will be prepared by teachers with one categories of material to be used in each station. Children are free to choose in which station they want to play and were observed in a group.

Results and Discussion

Through this free-play activity, we managed to observe how the children conduct the games among themselves with little guidance by teacher with regards to stations distribution. In the beginning of the session, teachers briefly explained about the materials and asked them to choose the station they liked and played with it. Once they are permitted to play, they tend to choose the station favorable to them. Through our observation, we discovered that most of the children knew what game they intend to play whereas some of the children just follow the majority.

During cloud in a jar activity, children were curious about what was the activity is about. After teacher give a brief explanation on how it would work, children were excited to try to make cloud by themselves. In the beginning of the activity, children were excited and curious how can a water produce cloud or fog in jar and why we need to put ice cubes on top of bottle lid. When teacher explained how it works children were so excited to repeat this activity many times as they managed to get cloud made by themselves. The aim of this activity is to allow children to do science experiment by their self to encourage children to think in science way and develop their interest in science subject. To make cloud, we need water, cool air and nuclei mean seed. When we pour warm water into a jar, it will produce water vapor in closed jar. When the water vapor meets cold surface on top of the jar, it will condense into hairspray lead into smoke or cloud that we can see clearly.

In second station, we planned an activity called as stop motion animation. Stop motion activity is can be recognized in Claymation movie uses plasticine. During this activity, children were excited to see toys as they thought that we are going to play with colorful toys. When teacher explained on how to play and made a short movie clip using toys, they were excited as everyone comes out with storyline of their lifestyle and some from the cartoon they watched in television. Here children could act as director of their short video clip and worked in a group to produce movie clip. They were excited when they saw they final movie output. This activity is aimed to introduced technology for children as they can use normal video phone to make a short movie.

Meanwhile, for third activity is called as craft stick catapult. We used to see catapult in movie genre war or fictions. For an example, catapult is uses to throw a heavy object such as rock during somewhere in 11th century Viking periods. This activity is for encourage engineering skill among children. In the beginning of, activity children were aware on what is catapult since they use this technique while playing in classroom, to provide proper construction of catapult, teacher explanation how could ice cream stick can be uses to build up catapult. By end of this activity, children able to construct different model of catapult based on their own idea with correct balancing to throw small object.

At color station, we were glad to see how creative the children are. They randomly choose the colors and drew on the mah-jongg paper using their creativity. When they move to watercolor section, children begin to do experiment on colors randomly by mixing two and more different colors and get new shades of colors. They were excited when they could produce new colors and begin to ask with curiosity how this could happen. Teachers took their responsibilities to explain how and why by explaining primary and secondary colors concepts. On the other sides, children play by dipping the sponge and plastic into the tray of water. When the sponge pulls in most of the water into it, children became surprise with the action. Here, teacher explained them the absorption process by using sponge and plastic sheet. By end of the game, children creatively use the sponge to dip into watercolors and dap on paper to draw a frog, sun, monkeys, houses and mountains. This game essentially revealed to us that they have developed their color sense and absorption concept by observing them mixing and painting on mah-jongg paper. We noticed that the children generously shared the colors and painters among themselves while painting on mah-jongg paper. Aside from that, generosity in terms of sharing were shown when the children were sharing their own stories about their pictures with each other. For example, a girl tried to explain about her picture with a frog on top of the house. Even though the drawing did not reflect the real shape of frog, children imagined that there was a frog in the drawing and has the capability to jump onto the top of the house roof. Apart from that, we discovered that when the children found painting and drawing on the mah-jongg paper to be tedious, they started to paint on their body parts such as hands. They used the brush and sponge to paint several of colors on their hands. They were delightful and enjoyed the body painting. This activity aimed to integrate Science and

Mathematics knowledge while playing with experimenting with the colors with larger and smaller portion to create new colors.

At fifth station, teachers prepared an activity called as coin value clip card where children need to count the amount of coins on card and find out the answers. In this activity, children are given cards with images of coins and they need to count the amount to get correct answers. This activity is to encourage mathematic skill among children on how to use money and explain the value of each coin so they could perform a small drama based on their idea to play this activity.

Conclusion

Today's education is moving toward to produce 21st century skills of community, by using developmentally appropriate approach which has been approved by government from early childhood. On the other hand, play is equally essential in early years for children in their developmental process. In that attempt, learning through play concept brings beneficial in child development and nurturing relevant knowledge that suitable for current era. STEM education is included in that approach, so children could learn the needs of future generation without losing their fun experiences of childhood years. Children needs space and freedom to prove what they want to do, to think and to execute their thoughts. This study proves that when children are given a chance to explore out of their boundary, they could express ideas and opinion without barrier and at the same time they able to learn new word and communicate more expressively. Free play enables children to think divergently and produce creative ideas to handle any object and situation. Implementation of free play in early childhood curriculum is essential to increase their creativity level and understanding on STEM elements since early years so new generation may update their self with 21st century skills. As a conclusion, free play giving a huge space for children to enhance their early development and new experience of learning through play.

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