3rd INVENTION, INNOVATION AND TECHNOLOGY COMPETITION (ITeC) 2021
E ISBN: 978-967-14569-5-8 (Publication Date: 28 October 2021)
UiTM Cawangan N. Sembilan, Kampus Seremban

101 INTERACTIVE STEM ACTIVITIES: AN E-BOOK TO GENERATE INTEREST IN STEM FIELDS AMONG PRESCHOOLERS

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ABSTRACT

STEM education refers to a concept that integrates four main subjects which are Science, Technology, Engineering, and Mathematics. In this modern world, where early childhood learning needs to adapt to the significant environmental changes that have occurred over the last decade, STEM education is the right tool to enhance children's skills in learning especially in critical and creative thinking. Through STEM, children learn to explore, observe, question and answer, and also take part in fun activities that are related to what is happenings around the world. Hence, it is important to ensure that STEM fields must be applied in formal education even among preschoolers. Despite knowing the importance of STEM education, many preschool educators are still having issues in implementing STEM activities. STEM education is known as difficult to implement in preschools since it is time-consuming and requires teachers' creativity through the process. Some of the teachers also have some issues with the lack of knowledge and information on how to conduct STEM-related activities. Therefore, this e-book is produced to help preschool teachers and educators implementing effective and efficient STEM activities. There are 101 suggestion activities with a list of items needed, together with a link and QR code on how the activities are being conducted. This e-book will give benefits not only to the teachers and educators but also parents as some of the teacher's roles have been transferred to the parents since the Covid-19 pandemic hit the world.

Keywords: STEM education, preschooler, creativity, problem-solving, e-book

1. INTRODUCTION

Preschool education gives significant benefits to children in preparing their basic knowledge before they attend formal primary school. Preschool education in Malaysia falls under the 4-year-old until 6-year-old age group. At an early age, children learn through observations, experiments, investigations as well as experiences which lead to questions and answer on how the world functions (Yücelyiğit, 2020). As children venture out into the world, they always encounter things they cannot label or explain. Curiosity is the underlying engine of learning, so it is common for curious children to ask: 1) Why is the sky blue? 2) Where does rain come from? 3) How is the rainbow formed? 4) What makes a building tall and strong? The curiosity, excitement, and observation skills are already possessed by the children since birth. Thus, this is why education that is constructed using Science, Technology, Engineering, and Mathematics (STEM) elements on a day-to-day basis plays important role in enhancing preschoolers' skills in learning. STEM education is not only important but seems as practicable education for children (Yücelyiğit, 2020). Furthermore, schools especially teachers need to keep pace with the STEM education development so that children will be able to explore their inquisitive nature in more creative ways which will enhance their brain development. Previous research demonstrated that STEM

education could enhance the problem-solving skills among children as it provides critical and creative thinking (Convertini, 2020; Yücelyiğit, 2020; Amran et al., 2021). This also aligned with the most finding that says the brain development is critical in the early years since during that time, children interact with the environment around them that will contribute to the foundation of how the world works (Slegers, 1997; Halfon et al., 2001). Thus, STEM education is one of the best educations to be included in preschool because it makes the learning experience more creative and fun for young children. However, there are several issues in STEM education particularly among the teachers, schools as well as parents in implementing STEM education to the preschoolers. One of the main issues is, most teachers are not well aware and familiar with STEM education. Even if they are fully aware, the lack of the right facilities and type of equipment make it difficult for the teachers to implement STEM-related activities (Bal et al., 2021). A recent study also highlighted that STEM education is uninteresting and difficult to do since teachers have lack information and knowledge regarding creativity in implementing STEM activities (Amran et al., 2021). The authors also commented other factors such as inadequate planning and budget constraints are the example of the issues faced by the teachers in implementing STEM education. Thus, this e-book will help preschool educators in giving some ideas on the STEM activities and how to implement them accordingly so that less time is needed for the teachers to plan and prepare for the activities.

2. STEM EDUCATION AMONG PRESCHOOLERS

STEM education enhances problem-solving skills among children as it enables them to critically look at problems from different angles and come out with different solutions for them. Young children especially preschoolers are natural observers and explorers thus, with STEM education, children will be able to explore, experiment, and understand more about what is going on with the world. In STEM, Science subject gives many benefits to preschoolers because they will understand life and phenomena that happened around them (Baltsavias, 2020). In Science, children will learn how to make a hypothesis, which is a theory that can be tested such as a sink or float experiment where a hypothesis tries to answer the question like why do heavy objects sink or light objects float? Children also will learn how to make an inference, which is an opinion based on the evidence of the experiment and sharing the result with their friends, teachers, or educators. In another STEM area such as technology, the world has evolved quickly due to technological advancement especially when the Covid-19 pandemic hit us. Most of the work done requires people to use technology as it can be done no matter where they are. Thus, using technology in preschool education gives an advantage to the preschooler since they can learn the use of technology in the early years. The children will learn and understand how technology can be used as a tool in making the activities effective and efficient (Lindeman et al., 2013 as cited in Baltsavias, 2020). Meanwhile, the area of engineering is the area that integrates all the STEM subjects since it involves the daily activities that children usually do such as using blocks to build a tower. During this activity, children will use a Mathematic concept such as the number of blocks needed to build a tall or short tower, and also a science concept in making hypotheses such as whether the larger or smaller base will stabilize the tower. This simple activity showcased that the engineering section in STEM develops children's problem-solving skills by using Mathematics and Science subjects. As for the last area in STEM, the Mathematic subject is important for the preschoolers as the knowledge and skills will be used not only in everyday life but also in their future. The number concept such as counting the objects and measurement concepts such as close or far, high or low as well as tall or short gives significant knowledge in the children's life.

3. 101 INTERACTIVE STEM ACTIVITIES: E-BOOK

Based on the previous discussion, there are several issues in implementing STEM activities among preschoolers. Most of the issues are related to teachers or educators as they are the ones who will guide the children throughout the process. Teachers must be able to integrate creativity during the activity so that the children would have an opportunity to observe, question, investigate as well as critically solve the problem. Thus, this e-book is produced to help and give awareness regarding STEM education. This book suggests 101 activities for preschoolers that integrate the STEM elements. These elements of STEM education are mainly related to children's development in the area of physical skills, cognitive

skills, and psychological of a child (Baltsavias, 2020). Other than the suggestion activities, this book also includes the links and QR codes for the teachers, educators, or parents to access the video of the activities. It also provides a list of the items required for the activities. Thus, this will give some ideas and knowledge to the teachers on how to implement the activities in preschool. Apart from that, with each activity, there are several suggested questions that the teacher could ask throughout the process such as "What can you see from the bowl?", or "What should we do to increase the weight of the bottle?" and other more interesting questions. This set of questions is one of the novelties of the product since it will help the children to think creatively which makes the activities effective and efficient.

Furthermore, the effectiveness of STEM education in preschool will help to achieve national goals in STEM education under Malaysia Education Bluprint (2013-2025). In this blueprint, the Ministry of Education targeted that student must be equipped with the application of STEM elements to ensure that future graduates can fulfill their employment need. There are several strategies undertaken to achieve this goal such as enhancing the quality of STEM education in school as well as create awareness and interest among the public about STEM education. Thus, this book, will not only gives benefits to teachers and parent but most importantly to create interest among preschoolers about STEM which then will develop their application STEM skills in primary school. This is also aligned with Sustainable Development Goals where STEM education plays a significant role in achieving sustainability. This is because the knowledge and skills students acquired from STEM education is important in understanding the global problems such as climate change, pandemic as well as pollution (Pahnke et al., 2019). This book also is the potential to be commercialized among young children's parents as well as kindergarten and child care centers.

4. CONTRIBUTION

This book is dedicated to the teachers, educators as well as parents in implementing STEM activities with preschoolers. The teacher will require less time to prepare the STEM activities as this book already suggests the activities, items needed, and the link of the related video on how to conduct the activities. Thus, the extra time that the teachers have may be used to observe the children's creativity and help the children to develop problem-solving skills which is the goal of STEM education. This book also will give the required information and knowledge needed for the teachers on the STEM activities since many preschool teachers are not familiar enough with STEM education. Besides, this book also is not only targeted at teachers in preschool but also for parents as during the Covid-19 pandemic most of the preschools are closed and the learning education has been transformed into home-based learning. Therefore, parents are required to guide and act as teachers for their children.

5. CONCLUSION

STEM education plays a significant role in preschool education since it provides many benefits to preschoolers especially in terms of developing creative and problem-solving skills among the children. However, there are several issues in implementing the STEM activities mainly on the educator or teacher side, as they are not familiar enough with the concept, lack of creativity in implementing the activities as well as lack of information and knowledge in terms of equipment and facilities needed to conduct the activities. Thus, this e-book, will provide alternative solutions for the problems and helping not only teachers and educators but parents as well in conducting STEM activities effectively and efficiently.

ACKNOWLEDGEMENT

I would like to also wish special thanks to the members of Graduate Researchers in Print (GRiP) for their encouragement, support, and idea in completing this paper.

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