

PRELIMINARY REVIEW ON PREPARATIONS IN MALAYSIA TO IMPROVE STEM EDUCATION

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Abstract: Strengthening the knowledge of Science, Technology, Engineering, and Mathematics (STEM) in human populations is one of the key elements in the fourth sustainable development goals (SDG4). Many countries are facing challenges to implement STEM education. Findings from international benchmarking such as Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA) revealed that students who originate from East Asia countries outperformed students from other countries consistently. This implies that the educators in East Asia countries are employing good strategies in the implementation of STEM education. This paper reviews the preparation of Malaysians in implementing STEM education and compares them with the preparations made by these East Asia countries. This is significant because it would help to benchmark Malaysians' effort in achieving SDG4. From this study, it was found that Malaysia has established necessary interventions suggested by the theory of change, but its effectiveness is yet to be known. The study allows educational researcher to identify the research opportunity related to educational research related to STEM education in Malaysia.

Keywords: Sustainable development goals (SDG), East Asia science education, theory of change.

Introduction

Strengthening the knowledge of Science, Technology, Engineering, and Mathematics (STEM) in human populations is one of the key elements in the fourth sustainable development goals (SDG 4). STEM education has been defined differently depending on regional needs (Council *et al.*, 2011; Glancy & Moore, 2013; Kim, 2015; Kelley & Knowles, 2016). Integrated STEM education is defined by Moore *et al.* (2014) as “an effort to combine some or all of the four disciplines of science, technology, engineering, and mathematics into one class, unit or lesson that is based on connections between the subjects and real-world problems”. Kelley and Knowles (2016) quoted the definition of integrated STEM education as “the approach to teaching the STEM content of two or more STEM domains, bound by STEM practices within an authentic context for the purpose of connecting these subjects to enhance student learning” and commented that there are

limits to this approach. They have proposed a conceptual framework for secondary education as shown in Figure 1. The framework was constructed using learning theories such as situated cognition theory and pedagogies that will lead to achieving key learning outcome. In the framework, the four STEM disciplines are connected by block and tackle of four pulleys bounded by the rope of community of practice. The pulleys allow learning activities of STEM subjects to be implemented more efficiently. Educators who planned to employ this framework in guiding their teaching needs to have a strong understanding of the relationship that can be established across domains (Kelley & Knowles, 2016). In Malaysia, a conceptual framework to implement STEM education from pre-school level until undergraduate level appeared in BPK (2016) as shown in Figure 2. In this framework, it was suggested that STEM education. should begin through students exploring and investigating their surroundings