Chapter 9

Saudi Arabia’s Female Middle School Mathematics Teachers’ Readiness and Attitudes Towards STEM Digital Technology Integration in Classrooms

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ABSTRACT

The purpose of this chapter was to identify and describe the extent to which Saudi female middle school mathematics teachers perceive the need for pedagogical content knowledge in integrated STEM education. To develop STEM education for girls’ schools, this study sought clarity from mathematics teachers how they intended to reach set goals. In this study, 118 female middle school mathematics teachers were surveyed for this study. Participants showed higher-level pedagogical knowledge; knowledge was not fully applied in their classrooms, and participants had an average level of subject matter knowledge related to STEM disciplines indicating a deeper need for STEM disciplines knowledge and systematic support, such as training courses or professional development programs.

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INTRODUCTION

On April 25, 2016, the Council of Ministers of Saudi Arabia endorsed and announced the Saudi Vision 2030, an ambitious plan to shift the economy from dependence on oil to a greater focus on investments and industry. The Vision is optimistic and a turning point for the Kingdom of Saudi Arabia regarding education and technology integration. As a result, the educational system must undergo significant changes to meet the country’s future needs. Regarding its effects on education, the Vision 2030 states that:

We will continue investing in education and training so that our young men and women are equipped for the jobs of the future. We want Saudi children, wherever they live, to enjoy higher quality, multi-faceted education. We will invest particularly in developing early childhood education, refining our national curriculum and training our teachers and educational leaders. We will also redouble efforts to ensure that the outcomes of our education system are in line with market needs. (2016, p. 9)

Mathematics, science, engineering, and technology are subjects believed to reflect people’s cultural achievements that power the engines of the economy and development, and at the same time constitute essential aspects of human life and its development. The study of these subjects combined as Science, Technology, Engineering, and Mathematics (STEM) in education occupy the forefront of investigation for many educators, researchers, and decision makers. Educators believe that it is vitally important that integrated STEM and Digital Technology education align with 21st century skills, create new jobs, increase competition in the global economy, and educate the next generation of STEM professionals (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2011). Digital Technology Integration provides the use of competencies in technology required to install, integrate, STEM, and other technology systems. Digital technology also involves working principles, processes, and standards which apply to the technology industry.

Due to the continuing vitality of the STEM topic, numerous in-depth studies have been conducted about different aspects of STEM education. Several papers discussed the essence of STEM education and STEM literacy (e.g. Zollman, 2012; Reeve, 2014; Stevenson, 2014; Vasquez, 2014). Other studies have addressed students’ perceptions toward integrated STEM (e.g. Faber et al., 2013). In addition, Berlin and White (2012), Koehler, Feldhaus, Fernandez, and Hundley (2013), and Murphy and Mancini-Samuelson (2012) studied in-service and pre-service teachers’ preparation for and attitudes toward STEM education. Other articles, such as Ernst (2014) and Stohlmann, Moore, and Roehrig (2012), discussed STEM curriculum and the integration of STEM disciplines. Bybee’s (2013) book addresses, in detail, challenges and opportunities in STEM education. As with any educational orientation, there are important reasons for the abundant local and international scientific publications on STEM education. Sanders (2008) described some of the reasons behind the American and international focus on STEM or “STEMmania”:

1. Sputnik, the first successful Soviet Union space satellite launched in 1957. This event shocked the entire USA as a nation and inspired the government to look for solutions to compete and by pass the Soviet’s advancements in science and technology.
2. The failing of students’ test results compared with Asian competitors.
3. The published reports and books, such as A Nation at Risk: The Imperative for Educational Reform (1983), The Shame of American Education by Skinner (1984), Rising Above the Gathering Storm
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