

# Infusing 21st Century Skills in a Smart Learning Environment for Secondary Mathematics Classrooms

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## **EXECUTIVE SUMMARY**

*The main objective of this chapter is to demonstrate how an instructional model, 2T2C, was used to infuse 21st century skills in the teaching of secondary school mathematics using a smart learning environment (SLE). It was imperative that cooperative and collaborating learning methodologies were included in the teaching model to ensure peer/teacher interaction to enhance student communication, the infusion of high-order thinking skills to guarantee that students can solve real-world problems and think at higher cognitive levels, the introduction of self-efficacy sessions to ensure that all students have the confidence and self-esteem to believe and have the self-assurance to solve mathematical real-world problems and take responsibility for their own learning, and the infusion of technology as a resource in the teaching and learning process: hence, 2T2C (thinking, technology, communication, and confidence). The scenarios presented highlighted the need for communication, high-level cognitive objectives, multiple evaluation practices, and thinking as key to the learning process.*

## **INTRODUCTION**

Facilitating students in elementary institutions as well as secondary schools to become effective creators, inventors and innovative citizens is progressively being recognized as one of the principal purposes of education. Today, the precipitous growth and accessibility of knowledge signifies the need for classroom instructional approaches that will empower learners to process and analyze knowledge using learner-centered strategies rather than merely memorizing and recalling facts imparted by teachers. A smart learning environment (SLE) is an ideal inclusion in any school system to curtail and even remove rote

learning activities. Rotherham and Willington (2010) suggest that this present era requires students to attain the kinds of skills that are needed to use information and technological communication devices and resources. Additionally, they need collaborative skills, particularly the ability to interact and communicate as part of the essential skills in today's world of work. This means that graduates from every education system should be equipped with the competencies to interpret, analyze, critically think independently, make inferences from information placed on the internet, communicate their ideas, and give constructive criticism and views. Learners in schools today are also required to construct original thought, predict how world policies and events may affect one's country, propose solutions, create innovative technological tools, solve real-world problems, judge ideas, express opinions, and make choices and decisions (Trilling & Fadel, 2009). Thus, an education revolution in terms of instructional strategies, policies and objectives in a smart learning space becomes inevitable.

## **BACKGROUND**

The exponential growth of technology is increasingly affecting everything we do, and this will continue in the future. The rise of artificial intelligence (AI) and machine learning (ML) algorithms is an indication that most aspects of societal life have the potential to be instrumented, interconnected, and infused with intelligent design. One area in which AI is greatly impacting our lives is education. AI has the capabilities, for example, to determine each student's educational needs in a classroom. This task is more challenging to accomplish as a teacher and will be a welcomed help. Additionally, students will benefit by having daily activities specifically formulated by an AI personal assistance.

In 1997, Malaysia, for example, approved and implemented a smart education project (Chan, 2002). Singapore implemented their Intelligent Nation (iN2015) Master Plan in 2006 (Hua, 2012). Australia's collaboration with IBM resulted in the design of a smart, multi-disciplinary student-centric education system (IBM, 2012). South Korea ratified the SMART education project to reform their educational system and improving educational infrastructures (Choi & Lee, 2012). The United Arab Emirates (UAE) endorsed a smart learning program named Mohammed Bin Rashid Smart Learning Program (MBRSLP) in 2012.

It must be noted that all these smart school projects were conceptually instituted to improve learning outcomes in the educational system and to prepare graduates with skills that meet the tests of the 21<sup>st</sup> century. The New York Smart School program, for instance, highlights that the role of technology integration into the classroom is to prepare students to be prepared to participate in the 21<sup>st</sup> century economy (New York Smart Schools Commission Report, 2014). Finland also established a smart education project that is continuing systemic learning solutions (SysTech) in 2011 with the aim of promoting 21<sup>st</sup> century learning with user-driven and motivational learning solutions (Kankaanranta & Mäkelä, 2014). The need to design and implement smart learning environments (SLEs) is inevitable for 21<sup>st</sup> century classrooms.

This case study discusses the author's project to develop an SLE in a secondary mathematics classroom in Trinidad and Tobago. For the author to create the SLE, his Thinking Technology Communication Confidence (2T2C) Model, derived from his dissertation (Warner, 2015), was adapted to ensure a 21<sup>st</sup> classroom environment was evident (see Figure 1 – 2T2C Model). The reason for creating an SLE is based on creating the best learning environments for students.

The following two sections presents a definition of SLE and presents a summary of the components of 2T2C and the learning objectives to be gained in infusing 21<sup>st</sup> century skills in a SLE in a secondary

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