


Chapter 1

Advancing STEM Education and Innovation in a Time of Distance Learning: Case Studies in China

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ABSTRACT

STEM education is a multidisciplinary teaching approach that aims at helping students develop knowledge in science, technology, engineering, and mathematics. This chapter aims to study the development of online STEM education of K12 group and its innovation in the era of distance education and popularity in China. This chapter will discuss the current situation of STEM education in China and the factors affecting the implementation of it particularly during the COVID-19 period. This chapter will study the learning outcome of K12 group by investigating the impact of STEM education on teaching mode. This chapter will discuss whether and how STEM approach would enhance teaching quality on K12. By applying bibliometric analysis, the chapter will perform statistical and correlation analysis on the STEM education. STEM and STEAM cases will be used for discussion. Finally, the chapter will provide suggestions for stakeholders to promote STEM education.

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INTRODUCTION

STEM education is not principally the sum total of “science + technology + engineering + mathematics education”, but rather, it is to be viewed as a whole new field of education (Yang & Gong, 2022). Compared with the traditional teaching model, it focuses on cultivating students’ independent innovation ability, problem-solving ability, deep learning ability and the ability to adapt to the future (Kelley & Geoff, 2016).

In modern society, the future innovation of science and technology will have a decisive impact on human economic and social development (Ren et al., 2022). Science is considered to play a crucial role in promoting technological progress and sustainable economic development (Driggers, 2011). Moreover, the new age of computational power and entrepreneurship (Vuong, 2019) necessitates the emphasis on science and technology to tackle the global challenges of humanity (Skorton, 2019). Many thorny global issues can no longer be solved with the traditional ideas of the past, and these problems need to be solved by innovative talents by using advanced science and technology (Ling et al., 2019). Considering the contemporary pressing issues - namely climate change, health disparities, food shortage, big data, cloud computing, the Internet of Things to artificial intelligence, from 5G construction to quantum communication, and even the future of 6G networks - one may say that science, technology, engineering, and mathematics (STEM) disciplines have become of greater importance than ever (Peng et al., 2019).

STEM education is forward-looking in modern times, and the way it is implemented is just as important. Technology transfer and information sharing from around the world have become increasingly common, most notably in the field of education, where institutions have ventured into the use of digital content to inform and train people, facilitating the use of tools that allow remote access, such as the use of computers and mobile devices among others (Eduardo & Ingrid, 2014; Yu et al., 2022a). Also, due to the recent global pandemic, educators of science and technology subjects have had to pivot and adapt their delivery to create alternative ‘virtual’ means of delivery (Crawford et al., 2020). All of these make it crucial for higher education teachers, educational researchers, and learning technologists to consider teaching and learning from the perspectives of digital education and innovation (Watermeyer et al., 2020; Yu et al., 2022b).

Therefore, this chapter aims to study the development of STEM education and its innovation in the era of distance education and its popularity in China. This chapter will discuss the current situation of STEM education in China and the factors affecting its implementation, particularly during the COVID-19 period. This chapter will study the learning outcome of the K-12 group by investigating the impact of STEM education on teaching mode. This chapter will discuss whether and how the STEM approach would enhance teaching quality for K-12. By applying bibliometric analysis, the chapter will perform statistical and correlation analyses on STEM education. STEM and STEAM cases will be used for discussion. Finally, the chapter will provide suggestions for stakeholders to enhance STEM education.

LITERATURE REVIEW

In this section, the authors referred to the literature on STEM, distance learning, the COVID-19 pandemic and some of the terms used in the educational field.

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