Chapter 4
Online and International Field Experiences in STEM Education:
Frameworks for Program Globalization and Growth

Jeremy Dickerson
Coastal Carolina University, USA

Dennis S. Kubasko Jr.
University of North Carolina at Wilmington, USA

Joe Winslow
Coastal Carolina University, USA

ABSTRACT

This chapter describes the development and integration of engagement-rich, short-immersion field experiences using international and online settings in STEM education areas, specifically science and technology. Many STEM programs in higher education settings are now utilizing online and international formats to add value to their programs and to give students unique delivery options that are outside of the traditional college classrooms. Online and international settings create challenges and opportunities to the way that field experiences must be organized and managed. This chapter addresses how some programs are meeting these challenges and using online and international program development to their advantage as STEM fields continue to emerge.

INTRODUCTION

Like many academic areas, STEM (Science, Technology, Engineering, and Mathematics) education is changing faster than ever. With technology and innovation at its very core, STEM education is being driven to adapt to new delivery and application environments so that it can produce more STEM educators (a high need area) and help more students learn valuable skills for use in college and in preparation for the

workforce. Educators in STEM areas do not have the option to sit back and enjoy the history and theories of STEM education alone. STEM education requires modern technologies and hands-on applications which are engaging and challenging for students who have often grown-up on the Internet. STEM education is advancing in content, methods, and techniques so quickly that it requires constant revision and reflection in order for educators to stay relevant. Field experiences – opportunities for students to apply knowledge within an authentic environment – are absolutely essential for STEM education students. It is within these contexts that students can use the knowledge and tools of their disciplines to help refine their practice and to help other learners master challenging content. This chapter presents processes for designing, developing, managing and improving STEM field experiences in online and international settings along with recommendations for ways to ensure student learning and engagement is optimized. Special attention is paid to the preparation of students, pedagogy of the design, and integration of the field experience within program, communication, observations and performance of the student in host setting, relationship building to support both reciprocity and sustainability of the project, formative and summative assessment of the project for accountability and future growth. Further, this chapter builds on anticipatory articulations of tomorrow's possibilities and connects how such experiences can support the success of STEM education students when as they prepare and enter the education field.

BACKGROUND

If it can be effectively argued that interactions across a community can play a critical role in the sociocultural development of a student's learning, then we can deduce that students can create valuable meaning from activities and experiences that require socialization (Vygotsky, 1978). By providing international field experiences that are predicated on sociocultural interactions in unique and novel situations, students can employ prior knowledge and understandings from their own context to mediate and create critical thinking opportunities as they are confronted with rich and immersive contexts. For example, when students are encouraged to engage and teach in study abroad opportunities, structured cross-cultural experiences can provide added benefits for preservice teachers in their realization of new perspectives that reverse stereotypes and dispel misconception (Walters, Garii, & Walters, 2009).

Rising Above the Gathering Storm, a National Academies report, articulated that the United States is falling short in providing effective STEM education to both our teachers and our students (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2007). In recent years, dramatic efforts to promote discourse, research and practice in STEM education have increased. The White House alone has invested substantial financial resources (2.9 billion dollars) into STEM efforts in the hope that this will lead to effective practice (Office of Science and Technology Policy, 2014). Educational reform efforts include the development of a comprehensive national curriculum for both science and mathematics that reflected the need for an integrated STEM approach (National Research Council, 2012). It can be argued that reforms in STEM education removes the traditional barriers that separates the four disciplines and relies on the intersection of disciplines leading to interdisciplinary solutions to existing real-world problems (Breiner, Johnson, Harkness, & Koehler, 2012).

Preparing pre-service and in-service teachers to lead today and tomorrow's students in STEM content knowledge acquisition is a desirable and significant goal. But, knowing and understanding STEM content alone will not garner the changes needed for our country to progress internationally. In order for our students to think and act globally, they need to be engaged in international field experiences

11 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/online-and-international-field-experiences-in-stem-education/199425

Related Content

Creating a Culture of Assessment: A Case Study for Building a Sustainable Model for Communicating Results to Guide Change
Amy E. Heathand Carrie Barrett (2024). *International Journal of Innovative Teaching and Learning in Higher Education (pp. 1-15).*
www.irma-international.org/article/creating-a-culture-of-assessment/337288

The Case of ISO 9000 Quality Management System Certification in a Faculty of a Turkish Public University: Triggers, Processes, and Consequences
Mehmet Eymen Erylmaz, Duygu Acar Erdur, Olcay Bekta, Esen Karaand Ebru Aydoan (2016). *Handbook of Research on Quality Assurance and Value Management in Higher Education (pp. 257-278).*
www.irma-international.org/chapter/the-case-of-iso-9000-quality-management-system-certification-in-a-faculty-of-a-turkish-public-university/148193

Open Educational Resources in Higher Education: Two Approaches to Enhance the Utilization of OER
Lubna Ali, Colette Knightand Ulrik Schroeder (2022). *International Journal of Innovative Teaching and Learning in Higher Education (pp. 1-14).*
www.irma-international.org/article/open-educational-resources-in-higher-education/313374

Smartphone-Based Virtual Reality as an Immersive Tool for Teaching Marketing Concepts
Haithem Zourrig (2021). *International Journal of Innovative Teaching and Learning in Higher Education (pp. 1-13).*
www.irma-international.org/article/smartphone-based-virtual-reality-as-an-immersive-tool-for-teaching-marketing-concepts/273628

Convergence and Internationalization of Higher Education in Europe: The Case of Romania
Luminia Nicolescu (2014). *Handbook of Research on Trends in European Higher Education Convergence (pp. 219-240).*
www.irma-international.org/chapter/convergence-and-internationalization-of-higher-education-in-europe/110094