

## Chapter 42

# Professional Masters' STEM Graduate Education Programs to Develop a Business–Savvy Workforce

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### **ABSTRACT**

*Educating the future STEM (Science, Technology, Engineering, and Mathematics) workforce is key to driving economic development worldwide in the 21<sup>st</sup> century. Institutions of higher education are challenged to grow their students' global competencies. Moreover, highly skilled and talented students need support to seek their business and industry opportunities directly connected to their graduate education. This chapter introduces a case study of interdisciplinary STEM education, known as professional science master's degrees, which has been developed and implemented in the United States for over a decade. The degree was created intentionally incorporating relevant business components customized to professional careers with the promise for increased business and industry economic development regionally, nationally, and internationally. Furthermore, this chapter was designed to help international educators and institutional leaders who seek new developments in graduate degrees in the area of STEM education align with future employment prospects.*

### **INTRODUCTION**

Institutions of higher education are challenged to strengthen STEM (Science, Technology, Engineering, and Mathematics) education and develop their students' global competencies to build a technically competent workforce in an effort to drive economic development.

Increasing STEM degrees awarded to undergraduates is one of the goals of US President Obama's Administration. The United States needs 1.3 million STEM professionals (scientists and engineers) by 2022 to fulfill the STEM workforce shortage and to grow the American economy (Congressional

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Research Service, 2014). In the 2016 national budget, more than 3 billion dollars will be invested to support STEM education through strengthening K-14 education including teacher training and undergraduate and graduate education. In the category of graduate education, the focus is on preparing the future STEM workforce to contribute to American innovations. The funding is for training individuals to become highly skilled scientists and engineers in areas such as national security (Office of Science and Technology Policy, Whitehouse, 2015).

When the issue is looked at from the international point of view, the current numbers of STEM graduates are lower than other disciplines, such as arts and humanities, social sciences, and law (Organisation for Economic Co-operation and Development, 2015). The shortage in the STEM workforce around the world is projected to continue over the decade unless something changes. In addition, educating students to obtain qualifications and skills, which are not only scientific knowledge but also for problem solving, communication, and critical thinking is important for the future workforce.

The innovative Professional Science Master's (PSM) degree, which has been developing in the US since 1997, is an important trend in STEM higher education at the graduate level toward educating the future STEM workforce in the US. PSM degrees are designed to provide science graduates with highly relevant business education tailored to professional careers that hold promise for economic development in the 21st century.

This chapter is designed to help educators and institutional leaders to develop graduate degrees in STEM that better align graduate education with future employment prospects. Similar approaches would be useful at the undergraduate level as well. The chapter presents a conceptual framework for the PSM degree and guidelines for official PSM "affiliation", a method for certifying the rigor of such a degree. Keck Graduate Institute's (KGI) early innovation in PSM development, which laid the groundwork for the trend in STEM graduate education for Master's students and, more recently, for post-doctoral students, is provided as a leading case study.

## **Conceptual Framework for the PSM**

The Professional Science Master's (PSM) degree is an innovative new type of STEM graduate education provided in fields ranging from biotechnology and information science to pharmaceutical science, data management, and cyber security.

The PSM degree is a class of degrees providing opportunities for students to acquire high-skilled training in STEM to meet the demands of employers. The curricula of PSM programs entail an average two years of both academic and professional training by combining scientific knowledge, professional skills, and experiential components such as paid internships. The conceptual framework of the PSM is targeted to produce the next generation STEM workforce that will contribute to the global economy.

Currently, PSM programs are classified in 23 disciplines across STEM fields of study, as shown in Figure 1 (PSM National Office, 2014). The most popular fields for this degree are Environmental sciences (13.5%), Biotechnology (12.4%), and Other biological sciences (10.9%)

In addition to relevant disciplinary content, the programs include mastery of professional skills:

- Resume writing skills,
- Cover letter writing skills,
- Interview skills,
- Negotiation skills,

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