BHEF Issue Brief

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BHEF BUSINESS-HIGHER EDUCATION FORUM

Aligning Higher Education STEM Production with Workforce Demand through Professional Master's Degrees

Graduate education in the natural sciences has traditionally emphasized doctoral training for academic or research careers. This training, however, is not meeting the demand for professionals in business, industry, and the public sector, where individuals with a combination of scientific, technical, and managerial skills will be required.

Professional master's degrees (often called Professional Science Master's (PSM) or Professional Engineering Master's degrees) aim to redress this mismatch by providing students with intensive interdisciplinary graduate level coursework in science, technology, engineering, and mathematics (STEM) fields, combined with training in management. PSMs have been hailed as the "21st Century MBA" and have grown dramatically recently. One of their key features is that business has been deeply involved in their development from the onset, to ensure that graduates have a seamless transition into high-demand STEM jobs.

Growing the STEM Workforce Pipeline through Professional Master's Degrees

The U.S. system of graduate education prepares some of the world's most highly skilled scientists, engineers, and technology workers, and can be seen as a linchpin of innovation. Graduate school provides students with advanced knowledge, training, and skills that are critical for an increasingly global and complex world.

Unfortunately, graduate education today typically focuses on Ph.D. programs that, by tradition, are designed to prepare students for academic careers rather than high-demand STEM careers in business, industry, and the public sector. These academically-focused programs often deter students who otherwise have the intellectual capacity and creativity to make valuable contributions to the non-academic private and public sectors. As a consequence, we are not producing sufficient talent at the graduate level in critical fields. That reality hinders U.S. business from reaching its full potential for innovation and potentially undercuts U.S. capacity to compete internationally.
To address these issues, universities have been innovative in conceptualizing and developing a wholly new concept in graduate education, the professional master's degree. In contrast to more

The Business-Higher Education Forum (BHEF) is the nation's oldest organization of senior business and higher education executives dedicated to advancing innovative solutions to U.S. education and workforce challenges. Composed of Fortune 500 CEOs, prominent college and university presidents, and other leaders, BHEF addresses issues fundamental to our global competitiveness. This issue brief was developed with the support of the Alfred P. Sloan Foundation as part of its decade-long focus on Professional Science Master's (PSM) degrees, and is designed to build understanding, awareness, and support for the PSM degree as a key component of STEM graduate education to meet workforce demand in the U.S. Learn more at www.bhef.com.

traditional master's-level programs, which can be seen as stepping stones to doctoral-level study and perhaps university research, professional master's degrees are specifically designed to prepare students for applied practice in their chosen fields. They typically combine extensive advanced training in a content area with training in management and communication skills. Such programs are organized specifically to meet the increased demand in business for "T-shaped" employees—professionals whose skills combine a depth of problem-solving ability with a breadth of advanced management and communication skills—and for the growing number of fields that require cross-disciplinary agility.

Professional master's degrees create a new and much needed bridge between employers and potential employees who have both advanced education in critical disciplinary areas and training in management, communication, and related skills that will enable them to readily apply that knowledge effectively in business settings. In these ways, professional master's programs create a bountiful new channel that is helping industry find and hire talent with the advanced skills it needs in STEM and other high-demand areas.

The Evolution of the Professional Master's Degree

The Alfred P. Sloan Foundation was an early advocate for the PSM. Through an extensive grants program that ran between 1997 and 2010, the Foundation promoted the development of the Professional Science Master's degree, which it characterized as "a two-year degree, heavily oriented toward coursework that provides a sound basis for work outside academia in scientific and technical fields."[i] The Keck Foundation has funded related efforts, and the Ford Foundation has supported development of professional master's degree programs in the humanities and social sciences.[ii]

Several organizations work to expand and maintain quality control of PSM programs, including the Council of Graduate Schools (CGS), the National PSM Association, and the National Science Foundation. Each of these organizations provides support to PSM faculty, staff, students, and alumni. The CGS, through support from the Alfred P. Sloan Foundation, is charged with reviewing PSM programs. In addition, the National Governors Association and National Conference of State Legislatures have also sought to raise awareness about these programs within their constituencies.

Professional master's programs encompass a diverse range of disciplines, including mathematics, physics, biology, computational sciences, forensics, chemistry, and geographical information systems. As of May 2011, there were some 238 PSM programs at some 110 institutions.[iii] The programs enroll about 2,500 students annually.[iv] The chart on page four shows a number of BHEF member universities that have successfully introduced PSM programs.[v]

BHEF corporate members and other prominent organizations—such as Raytheon, Battelle, Boeing, IBM, Northrop Grumman, PricewaterhouseCoopers, the U.S. Office of Naval Research, and the Department of Homeland Security— have already begun to hire PSM graduates and to support the development of PSM programs.

The reauthorization of the America COMPETES Act, signed by President Obama in early 2011, authorizes a number of programs that support the training of a STEM workforce. For example, the National Science Foundation's Division of Graduate Education funds the Science Master's Degree program and the Integrative Graduate Education and Research Traineeship program that provides interdisciplinary training to Ph.D. scientists and engineers.

Professional Master's Degree Programs

The Professional Science Master's (PSM) degree is the most notable example of a professional master's degree. The PSM typically combines intensive graduate-level training in science, engineering, or a mathematics-related field with coursework that provides business skills in fields such as financial and project management, communication, statistics, ethics, intellectual property, and regulatory affairs.[vi] Moreover, the essential mission of the PSM is to prepare students not for a life in academe, but for a wide variety of career options that meet the needs of non-academic employers, including industry, government, and the non-profit sector.[vii] Programs are usually designed with significant input from representatives from industries that hire their graduates. The advent of this new credential marks a truly significant development. Indeed, one university president recently described the PSM as the first major new degree focus since the MBA.[viii]

The California State University (CSU) system, for example has initiated a system-wide program that currently makes the PSM available through 24 programs in 16 fields at 12 campuses. The programs prepare students for science and mathematics careers in business, government, or non-profit organizations. CSU campuses have PSM programs in biotechnology, biostatistics, bioinformatics, clinical project management, medical physics, computational science, environmental science, ecological economics, forensic science, and genetic counseling.[ix]

Another example is the relatively new Master's in Professional Studies in Cybersecurity at the University of Maryland, Baltimore County (UMBC). SAIC, Battelle, and other corporations have partnered with UMBC to develop the new program.[x] Through the University of Maryland University College, SAIC offers its employees a range of opportunities to enroll in PSM and other degree programs.

Two related professional master's degrees are the Master of Engineering Management and the Master of Science in Engineering & Management. Designed to bridge the gap between engineering and management, these programs incorporate practical training in business principles that today's technical managers need in order to be successful in technology based-organizations. Although the structure of these programs varies, the degrees typically combine advanced-level engineering education with coursework in marketing, finance, intellectual property, business law, and management.

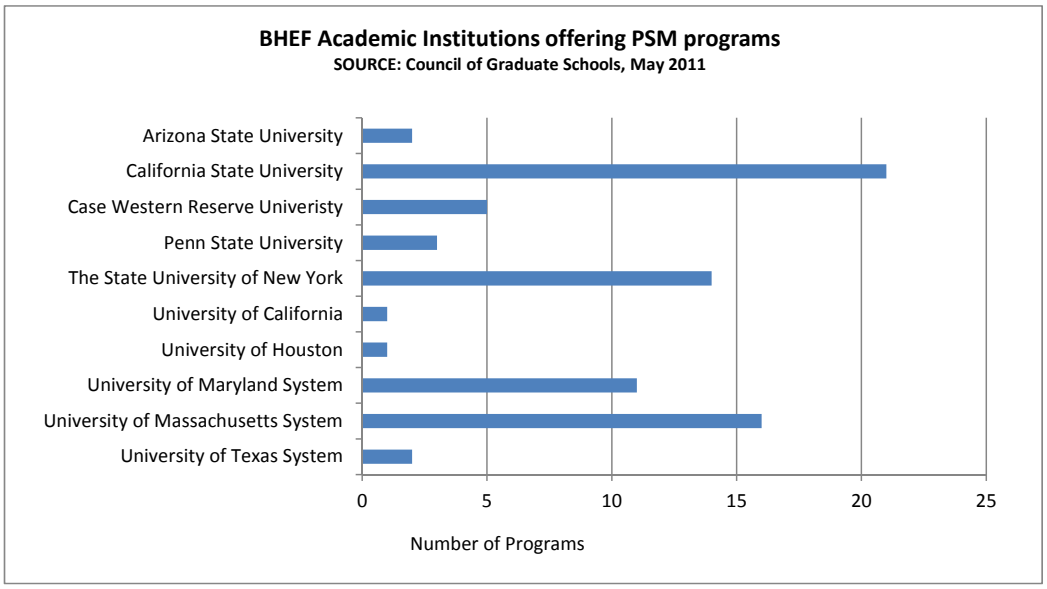
Cornell, Columbia, Pennsylvania State, and the University of Texas are among the BHEF member institutions that have developed such programs, whose corporate advisors include Northrop Grumman, IBM, Accenture, and Parsons.

A Call to Action

Many employers are not aware of the PSM and related degrees and the unique skills they impart. So that they can tap more effectively into this rich pipeline of highly skilled and adaptive talent, business and industry need to develop a better understanding of professional master's degree programs. Every corporation seeking to recruit STEM talent should develop a strategy that integrates students from these professional programs to fill its needs for skills in the workplace. Corporations should support their employees' participation in PSM programs through tuition assistance or reimbursements. Businesses should incorporate programs leading to these new professional degrees in their research collaborations with universities. They should retool their recruiting practices to ensure that they draw from the advanced talent and training that professional graduate-level programs produce.

Similarly, research universities have an invaluable role to play in doing more to collaborate with corporations to develop additional professional master's programs. Continued innovation is needed to design and execute programs that align in focus and content with workforce needs. Universities should continue and expand their practice of engaging with corporate partners in the development of professional master's programs.

Finally, policy makers need to become better aware of the potential of professional master's degrees in enhancing innovation and competitiveness in both the public and private sectors. Future legislation should include and support such progams.



For examples of successful PSMs go to www.strategicedsolutions.org.

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i Science Education: Professional Science Master's Degree. Retrieved June 2, 2011, from http://www.sloan.org/program/15

ii Background on the PSM Initiative. Retrieved June 2, 2011, from http://www.sciencemasters.com/PSMOverviewBackgroundonthePSMInitiative/tabid/72/Default.aspx

iii Professional Science Masters. Retrieved June 2, 2011, from http://www.sciencemasters.com/ScienceMastersHometabid/36/Default.aspx

iv The voice of the PSM. (2011, Winter). *NPSMA newsletter*, 4-1.

v The Council of Graduate Schools. (2011). *Professional Science Master's (PSM) Programs.* [Brochure].

vi National Research Council. (2008). *Science Professionals: Master's Education for a Competitive World.* Washington, D.C.: The National Academies Press.

vii National Research Council. (2008). Science Professionals: Master's Education for a Competitive World. Washington, D.C.: The National Academies Press.

viii Stephen Weber, president, San Diego State University, as cited in Fitzgerald summary of BHEF Winter Meeting February 2011.

ix Professional Science Master's Degree Program. Retrieved June 2, 2011, from http://www.calstate.edu/psm/

x As cited in Fitzgerald summary of BHEF Winter Meeting February 2011.