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MTSU's MSPS Program Bridges the Gap Between Academia and the Scientific Industry

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Abstract

The Professional Science Masters (PSM) is a nationally recognized two-year degree that is funded by the Alfred P. Sloan Foundation and is designed to allow students to pursue advanced training in the sciences while simultaneously developing highly-valued business skills. A PSM degree prepares students for science careers in business, government, or nonprofit organizations, where workforce needs are increasing. This unique program combines rigorous study in Science, Technology, Engineering, and Mathematics (STEM) fields with skills-based coursework in management, communication, and business law. PSM programs culminate in a "real-world" internship in a business or public sector enterprise, where students apply what they have learned in the classroom to the scientific industry.

At Middle Tennessee State University (MTSU), the PSM program has taken form as the Masters of Science in Professional Science (MSPS) degree. The MSPS program at MTSU serves as a national model for the PSM degree and is the fastest growing graduate program at the university. The MSPS degree is an exemplary master's program designed to promote the professional development of students through an interdisciplinary education of science and business. In addition to a strong business core, students choose a concentration area in Actuarial Science, Biotechnology, Biostatistics, Healthcare Informatics, or Engineering Management. The newest addition to the program, Engineering Management, is designed to teach students interpersonal, management, and engineering skills needed for their success in various industry or businesses, and meets the national need for professional engineering graduates with a comprehensive degree.

The interdisciplinary nature of the MSPS program fills a niche in industry management. By having experience in both of these disciplines, the career prospects double for the student. The MSPS degree is an essential step for those students pursuing a career in a science-related industry or academia. Classes involving advanced knowledge of scientific principles and research experience are required to ensure a solid educational foundation. By being able to analyze, understand, and present scientific data in a business setting, the MSPS graduate provides a valuable asset to the professional scientific industry.

The last requirement of the MSPS program is an internship which polishes the student's professional preparation. The student must complete 250 work hours at an industry in his or her chosen concentration. In addition to the individual assignments of the industry, students must compile a portfolio and give a professional presentation of their experience at the company. Oftentimes, an MSPS graduate is able to begin his or her career at the same company that hosted the internship.

This program facilitates strong partnerships with the scientific industry and the corporate world. MSPS curriculum prepares students for a career in professional science and provides scientific industries with a highly skilled workforce that can understand the related aspects of business and science. In turn, industries provide a place for the student to complete an internship and often receive a new employee who is already trained for the job. The partnerships formed through this program benefit all parties involved: the student, university, industry, and nation.

Introduction

Throughout the nation, the Professional Science Masters (PSM) is a fairly recent degree supported by the Alfred P. Sloan Foundation and created to provide students with a wider range of science-based career opportunities. The PSM initiative is driven by the national need to increase the number of professional scientists entering the workforce in order to rival global competition. At Middle Tennessee State University, the PSM program has taken form as the Masters of Science in Professional Science (MSPS) degree. Founded in 2005, the MSPS degree is recognized as one of the nation's most successful PSM programs. The MSPS program (commonly called Professional Science Masters or PSM) is a groundbreaking two-year master's degree in the sciences and mathematics that equips students for work in public and private business enterprises and in academia. This interdisciplinary program is a partnership among the College of Basic and Applied Sciences, College of Behavioral and Health Sciences and the Jennings A. Jones College of Business. The goal is to enhance the interface between science and business by providing strong degrees that emphasize expertise in both of these areas.

The MSPS program offers advanced curriculum in five different areas of science: Biotechnology, Biostatistics, Healthcare Informatics, Actuarial Sciences, and Engineering Management, along with a strong business core in accounting, business law, statistics, managerial communication and leadership coursework. The newest addition to the program, Engineering Management, is specifically focused on managing technical innovation and creativity in the workplace. The MSPS program is known for its outstanding students and received the highest scores in all categories in its 2009 5-year program review. The student retention rate for all concentrations is at 90 percent, with a graduation increase of 1900 percent between 2005 and 2009. In 2010, the Tennessee Board of Regents honored MTSU's successful MSPS program with the Academic Excellence Award.

Initiative

The inadequate numbers of U.S. citizens trained in science and engineering threatens to destabilize the economic welfare and scientific growth of our country. This problem is exacerbated by the declining interest of Americans in pursuing careers in science. The White House Administration has recognized this as a national issue and is addressing the problem through the "Educate to Innovate" campaign.[1] This effort seeks to improve the participation and performance of America's students in Science, Technology, Engineering, and Mathematics (STEM).[1] With programs such as the Professional Science Master's, American universities can address the lack of professional STEM scholars by offering a fleet of graduates who are ready to tackle scientific issues.

Interdisciplinary research has been deemed necessary by the Council of Graduate Schools for the future competitiveness of America, because "knowledge, creation, and innovation frequently occur at the interface of disciplines."[2] In the future, various issues confronting the nation in the 21st century will be addressed by a workforce comprised of individuals working across disciplines.[2] Some problems facing our society have become so complex that they are no longer able to be solved by a single academic discipline.[2] Businesses, governments, and nonprofits will increasingly need to collaborate with universities to develop and expand professional master's programs which produce graduates with interdisciplinary skills.[2]

Throughout the nation, the "Professional Science Masters" (PSM) is being implemented at various universities. The PSM is an innovative graduate degree designed to provide advanced training in science without a Ph.D., as well as training in business without an MBA.[3] Supported by the Alfred P. Sloan Foundation, this fairly recent two-year degree was created to provide students with a wider range of science-based career opportunities in business, government, or nonprofit organizations, where workforce needs are increasing.[3] The goal of the PSM degree is to enhance the interface between science and business by providing strong degrees which emphasize expertise in the areas of business and science.[4]

The MSPS degree program addresses the current national need to develop a workforce with more master's level students that are highly skilled and well-educated in the critical areas of math and science. In order to facilitate both the educational and professional development of the student, MSPS offers students an interdisciplinary curriculum that provides training in business and science. Therefore, MSPS graduates are able to attain the level of skill needed to occupy any job position, such as executive or laboratory researcher, within one of our nation's scientific industries.

Curricula

As with all PSM degrees, MSPS requires students to take both business and science classes. The MSPS degree program at MTSU combines the business management skills commonly found in the traditional MBA program with advanced learning in specific science fields. Specifically, MSPS provides students with advanced disciplinary science training in the concentrations of Biotechnology, Biostatistics, Healthcare Informatics, Actuarial Science, and Engineering Management, and interdisciplinary training in accounting, law, management, leadership, and communication techniques.[4] The MSPS degree is designed for students interested in mathematics, sciences, health related sciences, or business with some related job experience or undergraduate education.[4] The interdisciplinary nature of the program enables graduates to fill a niche in industry management. By having experience in both of these disciplines, the career prospects double for the student.

The MSPS program at MTSU was one of the nation's many interdisciplinary programs highlighted in the Council of Graduate Schools' document titled "Graduate Education: The Backbone of American Competitiveness and Innovation." The following is an excerpt:

> "The PSM program…is a promising example of interdisciplinary efforts as well. At Middle Tennessee State University, three PSM programs in biostatistics, biotechnology, and bioinformatics train students across disciplines, while ensuring they have basic scientific and mathematical expertise. Enrollment in these programs has nearly doubled in just one year. PSM graduates from the university have cross-disciplinary skills ranging from mathematics, to management and administration, to statistical analysis. Local and regional businesses, nonprofits, and governments collaborate with the university to establish internships to further develop the students' skills."[2]

The MSPS program at MTSU is recognized as one of the nation's most successful PSM programs, even though the inception of MSPS at the university was in 2005. The enrollment and retention rates for this program have been the highest among PSM programs across the nation. Each semester, the number of students enrolling and graduating with a MSPS degree has been steadily climbing. The MSPS program prides itself on being culturally diverse and strives to maintain this diversity by offering assistantships to women and minorities. The figure below shows the trend of enrollment and graduation, as well as minority participation since 2005.

Figure 1. MSPS Program 2005-10

MSPS Program							
	Fall 05	Fall 06	Fall 07	Fall 08	Fall 09	Fall 10	Fall 11
# Enrolled Graduate Students	20	39	51	59	57	73	80
# Degrees Awarded	0	1	4	19	21	39	28
# Part-time Students	13	26	31	34	26	35	30
# Full-time Students	7	13	20	25	31	38	50
Male	7	16	20	22	23	25	35
Female	13	23	31	37	34	49	45
White	12	18	21	26	27	37	38
Black	7	13	15	17	11	15	14
Other	1	8	15	16	19	21	27

Reports from the Department of Labor indicate an increasing demand for individuals with master's level training with a specialty in science. MTSU's MSPS program provides advanced training in the sciences along with enhanced professional business development. This combination of science and business training will assist individuals in the middle Tennessee area to meet current and future employment needs and to develop new workforce opportunities. [4]

Engineering Management

The Engineering Management MSPS degree offers an alternative to an MBA degree that bridges the gap between business and technology. This new concentration focuses on the skills required to stimulate and manage technological innovation and creativity, and help bring valuable ideas, goods, and services to the marketplace. The technology-based program differs significantly from the MBA and has a different set of required foundations of knowledge courses compared to the other four concentrations.

The Engineering Management concentration provides a broad-based core of management competency in the central business functions, along with a deep understanding of the technologies that enable specific business capabilities. Courses develop technical management competency while allowing the student to customize their depth of study in specific technologies that enhance long-term professional career goals.

In the current complex business environment, it is imperative that managers understand not only the elements of traditional managerial domains but also have deep knowledge of the innovative process. Modern innovation is more than just technology. It entails understanding various factors both within the corporation and in the larger business context. With this in mind, the MSPS degree in Engineering Management will comprehensively satisfy industry needs by training students in both the scientific arena and the business sector.

The goal of the Engineering Management concentration is to marry the art of engineering and technology with the professional arena of management. In order to be a successful manager of technology the student in this concentration must have both the applications-focused skills in technology, coupled with leadership and management skills. This concentration teaches students interpersonal, management, and engineering skills needed for their success in various industry or businesses, and meets the national need for professional engineering graduates with a comprehensive degree. This degree allows graduate students to fast track into engineering and technical management or high-value specialty management positions. Applicable industry careers include manufacturing/assembly, medical, human resources/training, service, and applied sciences.

Internship

Connections with local industries are utilized to introduce students to a scientific working environment. For this reason, the last requirement of the MSPS program is an internship which polishes the student's professional preparation. The student must complete 250 work hours at an industry in his or her chosen concentration. In addition to the individual assignments of the industry, students must compile a portfolio and give a professional presentation of their experience at the company. Internships with local industries facilitate real-world, hands-on training in the student's chosen field and promote career-path development for graduates. Oftentimes, an MSPS graduate is able to secure a job at the same company that hosted the internship.

The internship component facilitates the continuum from classroom to industry. The student is provided an opportunity to obtain experience in an industrial scientific environment and to increase his or her grasp on scientific procedures and principles. In addition, the internship opportunity benefits the MSPS students by expanding their knowledge about current scientific practices, which in turn makes them more presentable to the industry.

The internship is a crucial component of the MSPS program because students gain real-world experience in a scientific industry setting. During the internship, students apply classroom knowledge to scientific problems and use their acquired skills to solve them. The internship prepares students for their future careers by teaching discipline and professional communication.

Partnerships

The MSPS program facilitates strong partnerships with industries. MSPS course curriculum prepares students for a career in professional science and provides scientific industries with a highly skilled workforce that can understand the related aspects of business and science. In turn,

industries provide a place for the student to complete an internship and often receive a new employee who is already trained for the job. The partnerships formed through this program benefit all parties involved: the student, university, industry, and nation.

Conclusion

At MTSU, the MSPS degree gives students a strong scientific background in the disciplines of Biostatistics, Biotechnology, Healthcare Informatics, Actuarial Science, and Engineering Management, while simultaneously preparing them for the future of the scientific industry through a component of business-related courses. This program trains graduates to serve dual competencies within the same job, which is an increasingly advantageous quality for career placement. Perhaps most importantly, MSPS addresses the current national need to develop a workforce with more master's level students that are highly skilled and well-educated in the critical areas of math and science. The MSPS program at MTSU serves as a national model, as it is not only the fastest growing degree program at the university but also the fastest growing PSM program in the nation.

These instructional areas along with the rigorous coursework allow students to develop a "T-shaped" experience, where students gain a broad spectrum of real-world knowledge while at the same time concentrating in a particular scientific field. The Master's in Professional Science at MTSU is an appropriate and compelling degree towards meeting the need for a diverse and highly competent scientific workforce in America.

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