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Trends in Education

Creating the Scientific Equivalent of the MBA

by Cassandra A. Simmons

Some call it a disconnect. Others refer to misalignment. But when it comes to the way graduate students in the sciences are educated and the jobs many of them are expected to perform, workforce analysts agree that the needs of the science and technology industries demand more focused, more industry-responsive, and shorter, timelier educational opportunities. Professional Science Master's programs at dozens of universities are attempting to do just that.

The continued growth of high-tech industries depends greatly on the availability of a workforce that is adequate not just in numbers but in professional scientific qualifications. Although employers say they are generally pleased with the results of U.S. graduate education, there are shortfalls. In the sciences, graduate education, especially Ph.D. programs, have been targeted mostly toward narrow specializations and careers in research. Employers today cite an urgent need to prepare graduate students for scientific/technology careers outside of academia, in sectors of industry beset by significant and continuing shortfalls in the workforce pool.

Surveys show that employers expect graduates to be knowledgeable in their scientific field, but they want them to be able to work across disciplines and cultures, communicate across departments and with customers,

and perform well in team settings. In other words, the expertise and training required for jobs in business and industry are not provided in a traditional science graduate degree program. What students and industry say they need is the scientific equivalent of an MBA.

Beginning in 1997, the Alfred P. Sloan and Keck Foundations recognized that by bringing corporations into partnerships with universities, a broad-based curriculum could be developed that would effectively increase the pool of science professionals qualified and motivated for careers in industry. Out of this system, the Professional Science Master's Degree program (PSM), would come scientists and researchers able to communicate highly complex science and technology issues to their colleagues, non-scientific bosses, and government officials while acting as links between the laboratory and the boardroom.

Seeking a Solution—The Scientific Equivalent of the MBA

Since its inception, the PSM program has engaged 30 colleges and universities to reconfigure their Master’s degree in science and mathematics as a means of addressing the needs of students, industry, and society. The programs, developed in concert with industry, are meant to address shortfalls in practical “real world” business skills and prepare students for present and future work opportunities.

The basic goals of the programs are:

- providing appropriate curriculum for students seeking careers in the private sector, science, technology, and business;
- producing students prepared to enter the private sector and able to contribute to the corporate bottom line immediately; and
- raising the profile and value of the science Master’s degree, which traditionally has been viewed as the “poor relative” of a Ph.D.

The programs are open to holders of Bachelor’s and other degrees mainly (but not exclusively) in the sciences, mathematics, or engineering. They are aimed at students with an interest in wider career

Elaine Laws, AT&T Labs’ District Manager for University Relations and Recruiting, says her company needs scientists who can use their secure subject area knowledge and have the ability to leverage it to solve practical business issues. Some traits she looks for include the ability to:

- work effectively on teams as well as to lead them;
- understand and design cost-effective solutions; and
- be convincing when speaking, writing, and staging effective multimedia presentations.

options than those provided by existing programs—more specifically, for careers outside academia, in such fields as research management, technology transfer, consulting, banking, and insurance. Programs generally involve two years of training in an emerging or interdisciplinary area. Many include internships and “cross-training” in business and communications. The programs target an emerging or interdisciplinary field, such as biotechnology, or may apply scientific training to some non-technical applications, such as financial mathematics.

The Traits Employers Need in Today’s Science Graduates

In late 2002, The Conference Board co-sponsored a forum on “New Careers, New Career Paths for Science Trained Professionals,” with the New Jersey Institute of Technology. The traits most frequently mentioned as essential for a solid transition into the business world for today’s science graduates included:

- leadership
- project management
- team building
- communication skills
- planning and organizing
- interpersonal skills
- adaptability
- multi-cultural competencies

The advantages of the PSM program:

- More science than an MBA
- More informatics and computation than an MBA or an M.S. in a scientific discipline (other than computer science)
- More education in professional fields (business, law, communication) than a traditional M.S. or doctoral program in a scientific discipline
- Closer interaction with potential employers through internships and other experiences than a traditional M.S. or doctoral program in a scientific discipline.

Signs of Success

The PSM programs that The Conference Board studied (with a Sloan Foundation grant) appear to have an advantage over the typical graduate experience. In the talent market as a whole, increasing numbers of Ph.D.'s (and, in many cases, MBAs) end up in positions that are far from their interests, expectations, and academic qualifications. In contrast, PSM graduates matriculate from programs they have specifically chosen to prepare them for careers in applied research and development and/or industrial administration or management.

A Conference Board survey of recent graduates from PSM programs at 12 universities found that students met with good success in securing employment in a time of economic retrenchment—91 percent of survey respondents said they landed positions in their chosen field after graduation. In an uncertain economy, employers' welcoming reaction to the programs' graduates can be taken as a sign of approval.

Nearly half of the PSM graduates believed employers value their degrees. When graduates were asked how they viewed the PSM degree in competition with others, they gave it high marks. They rated the PSM as being competitive with a Master of Arts or Master of Science

degree, and with the traditional BS/BSE plus two years of job experience. A total of 41 percent felt that the degree was competitive with an MBA.

Pay also appears to be competitive. A total of 66 percent of respondents to The Conference Board survey said their salary was \$50,000 per year or higher, and 12 percent said it exceeded \$70,000. By comparison, according to the National Association of Colleges and Employers survey published in 2002, the average offer to Master's degree candidates in physics was \$50,000, biological sciences \$33,500, non-technical MBAs with one year or less experience, \$43,000, technical MBAs with one year or less experience, \$45,000, and computer sciences \$65,900.

A Look at Two Programs

Michigan State University is renowned for its math programs, and MSU built its Professional Masters in Industrial Math Program on that expertise. Prof. Charles R. MacCluer, who runs the program, reports that the students selected for it come from a variety of math concentrations, and the program's course work in other concentrations broadens their perspective and gives them a deeper understanding of computational issues.

MSU's micro MBA is the program's "jewel in the crown," says Dr. MacCluer. It is a certification program designed by MSU's business school, the communications arts department, and industrial advisors. Over ten weekends, students learn the basics of financial management and work in teams on a case study drawn from a real company business issue, in conjunction with a faculty advisor and industry liaison. They must produce a written technical report, present it orally to the company, then deliver the final version. This experience has led to the hiring of many students not only as interns but also as consultants to continue working on the projects.

“I tell my students and the companies we approach, that beyond every business problem may lie some interesting mathematics,” says Dr. MacCluer. He believes the unique advantages of the Michigan State PSM program include:

- Breadth of substantive math courses
- Industrial experience through work on real business projects
- Focus on team work—unusual for math students
- Focus on written and oral presentations
- The business know-how gained from the micro MBA component
- Students’ ability to add value across many different specialties
- Students’ confidence that they can take on anything

Georgia Institute of Technology’s Bioinformatics Master’s Program focuses on meeting the needs of the pharmaceutical and biotechnology industry for data mining in biology. Dr. Jung Choi, who heads the program, says the program was built around the school’s expertise in math and computer science. The program accepts students with a variety of graduate degrees and has designed special courses to bring each one up to speed in other disciplines: biology, computer science, and math. Students also receive an introduction to legal issues in biomedical engineering and technology transfer. Faculties from all the participating disciplines have been very supportive, he says. They use students in their own research, and they tap into their own industry, government, and academic networks to help them get jobs.

Universities that are participating in Professional Science Master’s Degree Programs:

Arizona State University	Keck Graduate Institute of Applied Life Sciences	San Diego State University
University of Arizona	Michigan State University	San Jose State University
Boston University	New Jersey Institute of Technology	Temple University
University of California–Los Angeles (UCLA)	North Carolina State University	University of South Carolina
University of California–Santa Cruz	Northeastern University	University of Southern California
Case Western Reserve University	Oregon State University	State University of New York at Buffalo
University of Connecticut	Pennsylvania State University	University of Texas–El Paso
Georgia Institute of Technology	University of Pittsburgh	University of Utah
Illinois Institute of Technology	Rensselaer Polytechnic Institute	University of Wisconsin
Indiana University–Purdue University Indianapolis (IUPUI)	Rice University	Worcester Polytechnic Institute
	Rochester Institute of Technology	

An ironic twist on the success of the program's graduates is that their new industry bosses, who are often Ph.D.'s, suggest that they return to school for Ph.D.'s. But since the point of the program is to increase the number of competent science professionals faster than the Ph.D. track, he tells those students, in effect, "Go back to work. You've already had all the same course work as Ph.D.'s, so why spend the next three to five years on a narrow problem in an academic lab? Better to spend it on the problems in your industry."

Since very few senior managers have Ph.Ds, he says, a PSM degree should not limit opportunities for promotion. He's even had some managers tell him that they prefer non-Ph.D.'s because they are more flexible—a quality companies value.

To learn more about the Professional Science Masters Degree Program, including recruitment opportunities go to www.sciencemasters.com/recruiters

About the Author

Cassandra A. Simmons started her distinguished career as an academic psychologist at Michigan State University where she attained tenure. Prior to joining The Conference Board, Dr. Simmons, a widely published author, lecturer, expert witness in over 20 court cases, and an educational, government and corporate consultant, was an Assistant Dean and member of the faculty at the Harvard School of Public Health. She has organized and led several delegations of medical and other scientific professionals to developing countries to assess healthcare delivery systems. Dr. Simmons has continued to focus on issues of equity, access, and innovation in her role as Program Director at the Board. Her most recent contributions resulted in the publication of research reports addressing mature workers and setting standards for effective diversity leadership for corporate diversity executives.

About this Report

This Executive Action report is based on material contained in The Conference Board report *New Career Paths for Science Trained Professionals* by Cassandra A. Simmons. To obtain the full report go to www.conference-board.org/sciencemasters.htm

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