



Communicator

Council of Graduate Schools

www.cgsnet.org

Volume 43, Number 8 • October 2010

PSM Recognition Project: Stakeholders Recommend Principles and Criteria for PSM Program Recognition

Development of Professional Science Master's (PSM) programs, initiated in 1997 by the Alfred P. Sloan Foundation, has accelerated in the past several years, indicating strong interest in these innovative degrees that offer rigorous scientific training coupled with professional workplace skills activities. The professional component that characterizes the PSM provides degree recipients with skills that are appropriately aligned with the needs of 21st century employers. In 2006, the Sloan Foundation provided funding to the Council of Graduate Schools (CGS) to encourage more extensive development of Professional Science Master's programs and to "brand" the PSM as a recognized degree. To this end, CGS established a national PSM Advisory Board composed of representatives from academic, industrial, association and other relevant constituency groups. The Advisory Board developed the *Guidelines for CGS Recognition as a Professional Science Master's Program*. The *Guidelines* are currently used to determine the eligibility of programs to be officially recognized as a PSM, to be listed on the www.sciencemasters.com website, and to be permitted to use the official PSM logo.

Over the last four years, there has been a significant increase in the number of PSM programs, with a current total of well over 200 programs at more than 100 institutions. This growth in the number and diversity of PSM programs has resulted in more time required for CGS to review programs for PSM recognition and in increased efforts at CGS to sustain the promise and success of PSM programs. Therefore, in 2010, CGS embarked on a year-long project, supported by the Sloan Foundation, to develop a more formal, sustainable, widely recognized and accepted review process (see Lynch, Babco, & Vincent, 2009). A day-long stakeholders meeting was convened on June 29 in Washington, DC to 1) establish clear principles to guide the development of criteria that would form new guidelines for PSM program recognition and 2) create those criteria. Twenty-two representatives comprise the broad stakeholder group, including PSM program directors; graduate deans; employers from the business, nonprofit, and government sectors; policymakers; as well as representatives from the Sloan Foundation, National Professional Science Master's Association (NPSMA), and CGS. The names and affiliations of the stakeholders are listed in Figure 1.

In opening the meeting, CGS President, Dr. Debra Stewart described the PSM as a "prime innovation in the US that has greatly impacted the sciences and master's education broadly." Dr. Stewart said that this first of three stakeholders meetings would concentrate on the core characteristics of the PSM. The foci of the second and third stakeholders meetings will be PSM recognition processes and supporting organizational structure. The goal of the three stakeholders meetings is to produce a process that will contribute importantly to PSM quality and sustainability.

The stakeholder group engaged in a two-stage process. First, general principles for recommending characteristics and criteria of PSM programs were drafted and agreed upon. Second, emphasizing input from representative employers who were present, recommendations of program recognition criteria that would meet employer needs were presented and discussed. The stakeholders proposed core requirements for both science/mathematics and professional skills courses, and determined other essential components for PSM program recognition, including the use of employer advisory boards, providing internship opportunities, developing employer-sponsored learning projects, committing to annual reporting of enrollment and degree data, and tracking the employment history of graduates to support assessment of program outcomes and success. The stakeholders' recommendations will inform the development of mechanisms necessary to ensure the quality and integrity of future programs which is the work of the second stakeholders group at its upcoming meetings.

Historical background and context was provided for the group by Dr. Donald Langenberg, Past Chair of the CGS PSM Advisory Board, Director of Strategic Planning and External Projects at NPSMA, and Chancellor

continued on next page

INSIDE

NSF Notice of Errors in Survey	4
Data Sources	5
CGS Research Note	7

PSM Recognition Project

FIGURE 1

	Stakeholders	Affiliated Institutions	Constituent Groups
1	Cheril Lin Abeel	Graduate of Michigan State University Industrial Math Program	PSM Alum
2	Warren Baker	California Polytechnic State University	Academic Administrator
3	Julie Davis Bell	National Conference of State Legislatures	Government-Federal & State
4	Joan Berkowitz	Farkas Berkowitz & Company	Industry/Business
5	Patricia Bishop	University of Central Florida	Academic Administrator
6	Rita Colwell	National Academy of Science	Other Organization
7	Daryl Chubin	American Association for the Advancement of Science	Professional Disciplinary Society
8	Andrew Comrie	University of Arizona; CGS Board of Directors	Academic Administrator
9	Cliff Chancey	University of Northern Iowa; National PSM Association	Program Director
10	Heather Ericson	Medtech	Industry/Business
11	Michelle Fox	Department of Energy	Government-Federal & State
12	Sally Francis	Oregon State University	Academic Administrator
13	Mary Kirchoff	American Chemical Society	Professional Disciplinary Society
14	Donald Langenberg	National Association of System Heads	Academic Administrator
15	Michael Mondshine	SAIC	Industry/Business
16	Debra Stewart	Council of Graduate Schools	Higher Education Organization
17	Linda Strausbaugh	University of Connecticut	Program Director
18	Michael Teitelbaum	Alfred P. Sloan Foundation	Other Organization
19	Bogdan Vernescu	Worcester Polytechnic Institute; National PSM Association	Program Director
20	David Ward	Formerly of American Council on Education; University of Wisconsin at Madison	Academic Administrator
21	Joseph Whittaker	Morgan State University; NPSMA Board of Directors; HBCU Alliance; Sigma Xi	Academic Administrator
22	Lilian Wu	IBM	Industry/Business

Emeritus of the University System of Maryland. He spoke about the original development of the current *Guidelines*, as well as the origins of the program which established the legal ownership of the PSM “certification mark” by the Sloan Foundation.

A discussion of the issue of defining “science” in the PSM context, given the breadth of the sciences and the increasingly interdisciplinary nature of knowledge and inquiry, was moderated by Dr. Linda Strausbaugh, Professor in the Department of Molecular and Cell Biology at the University of Connecticut, and chair of the CGS PSM Advisory Board. Dr. Cliff Chancey, Professor and Head of Physics at the University of Northern Iowa, proposed a set of assumptions for core competencies expected of PSM students to inform the group’s work on drafting the criteria for PSM program recognition.

From these discussions, the following principles were adopted to guide the development of criteria for PSM recognition:

Criteria for granting PSM status will achieve all of the following:

- focus the program’s mission, goals, and outcomes appropriate to the particular degree;
- demonstrate excellence in professional graduate education designed to engage and prepare students for a variety of career options in industry, business, government, or nonprofit organizations;
- demonstrate active and ongoing engagement with relevant employers;
- specify and commit to student learning outcomes inclusive of scientific content relevant and essential to the focus of the degree program and future careers;
- specify and commit to student learning outcomes inclusive of professional skills, behavior, ethical decision-making and practical experiences relevant and essential to the focus of the degree program and future careers; and
- provide ongoing assessment for continuous improvement, adaptation, and innovation.

The group recommended that the following criteria be met to qualify for PSM status:

- The higher education institution must be accredited by a regional accrediting agency.
- A program must have a stated mission, goals, and outcomes appropriate to the particular degree.
- The total number of credits must be at least equivalent to the minimal number required for a master’s degree at the institution.
- Programs must include the following three components:
 - 1) A majority of the course content in the natural sciences, technology, engineering, and/or mathematical/computational sciences in which knowledge is commonly advanced by an active research community engaged in peer-reviewed quantitative research. This coursework may be interdisciplinary or multidisciplinary.
 - 2) A professional skills component must be developed

in consultation with employers. Examples of professional skills components include business basics, policy, legal and regulatory issues, finance and marketing, organizational behavior, ethics, communication, and teamwork. These courses and/or activities are often developed in collaboration with appropriate academic units outside the sciences.

Adjunct faculty members from targeted employment sectors further enhance students’ learning experiences.

3) An experiential component that must include at least one capstone project, supervised and evaluated by faculty and typically developed with an employer(s), which integrates the practical application of scientific and professional knowledge, behavior, and skills. The experiential component typically includes a structured internship. The product must consist of a written proposal, a report, and an oral presentation.

- Program quality assurance must be provided using the faculty-based mechanisms normally used by the institution for graduate programs in order to ensure institutional integration and sustainability.
- An active and engaged employer advisory board is required. Examples of collective and individual board-member functions include providing advice on the program curriculum, assisting with projects and placement, and interacting individually with students.
- The program must report annual data relative to enrollment, degrees, completion, and demographics, and attempt to track the employment history of every graduate to help assess program outcomes.
- Programs agree to use the name “Professional Science Master’s” and the PSM logo on websites and other promotional materials.

Following the stakeholders’ approval, the above criteria and a comment form were sent to approximately 1,000 individuals, including all PSM program directors, all CGS member deans, other interested faculty members, targeted employers, policymakers, PSM alumni, and others interested in the process of ensuring the quality of the PSM degree. The recipients were encouraged to distribute the comment form to others who have an interest and were given approximately one month to provide feedback regarding perceived importance and appropriateness of the manner in which the criteria were expressed. Additionally, the comment form was available to the public on www.sciencemasters.com. One-hundred and sixty-four completed comment forms were returned to CGS. Fifty-three percent of the respondents were from a college or university with actively affiliated PSM programs and 38% were from a college or university without currently affiliated PSM programs or in the process of seeking affiliation. The remaining 9% of respondents were from business, nonprofit, government, and other organizations such as private funding institutions and higher education associations.

More than half of the respondents (52%) were college or university administrators and 39% were faculty members.

continued on next page

PSM Recognition Project

Approximately 10% of the respondents were former students, management-level employees of biotech companies, research scientists who are not affiliated with universities, and association members.

The overwhelming majority of the respondents agreed that the higher education institution must be accredited by a regional accrediting agency (94%); that a program must have a stated mission, goals, and outcomes appropriate to the particular degree (92%); and that the total number of credits must be at least equivalent to the minimal number required for a master's degree at the institution (91%). The respondents were also in strong agreement with both the content of and manner in which the remaining PSM criteria were expressed. Agreement with the remaining criteria ranged from 70% to a high of 92%. It is particularly noteworthy that feedback indicated that it is important to have national criteria for PSM recognition and that the draft criteria do provide a complete picture of the essential attributes of a PSM program. Preliminary analysis of the open-ended comments reveals useful suggestions for finalizing the criteria, such as the need to provide flexibility in their application, improvements in clarity, and ideas for implementing their use in reviewing programs seeking PSM recognition. Analysis of the feedback will be provided to the second Stakeholders Group at its initial meeting on September 30 in Washington, DC.

To summarize, the steady growth of PSM programs is encouraging as it increases the diversity of educational and employment options in STEM fields but brings with it the challenges of ensuring the quality, integrity, and sustainability of these innovative, multidisciplinary programs. The stakeholders' recommendations of principles and criteria and dissemination of the principles and criteria to the broader community represent critical steps in developing a more formal, sustainable, widely recognized and accepted review process and also contribute to establishing the PSM brand as a regular feature of graduate education. From the remaining two stakeholders' meetings, a plan for a new recognition process will be produced that will take the PSM forward.

Contacts: Carol Lynch and Sally Francis

Lynch C., Babco, E., & Vincent, N. (2009). "Affiliation as a Professional Science Master's (PSM) Program." *CGS Communicator*, p.8, vol. 42 #9 (2009).

NSF Notice of Errors in Survey of Doctorate Recipients Race/Ethnicity Data

A problem in data on individuals who reported more than one race to the Survey of Doctorate Recipients (SDR) in 2003 and 2006 has been uncovered by the Division of Science Resources Statistics (SRS) at the National Science Foundation (NSF) and its contractor for the SDR, the National Opinion Research Center (NORC) at the University of Chicago. Multiple-race individuals were erroneously classified in SDR data files as having only one of the races they had reported. The effect was to overestimate the number of blacks, Asians, and American Indians, and to underestimate the number of multi-race individuals. SRS and NORC deeply regret this error.

Data in a number of previously released SRS publications are affected to varying degrees. Because the SDR is a component of the Scientists and Engineers Statistical Data System (SESTAT), 2003 and 2006 SESTAT records for doctoral scientists and engineers derived from the SDR are also affected. SDR and SESTAT data on variables other than race and ethnicity are not affected, and the effect of the race error in SESTAT is limited to those holding a US doctorate in a science or engineering field.

NORC is correcting the race/ethnicity data for the 2003 and 2006 SDR. SRS will release the corrected SDR and SESTAT data files as quickly as possible and will also correct its affected publications. Revised publications, with corrections noted, will be available at www.nsf.gov/statistics/. SRS will keep the community informed of progress in remedying the problem.

SRS and NORC apologize for any inconvenience this error may have caused. We are instituting additional procedures to ensure that such a problem does not occur in the future. For questions please contact: srsweb@nsf.gov.

By Lynda Carlson, Division Director and Mary Frase, Deputy Division Director, Division of Science Resources Statistics, National Science Foundation