

# Developing Professional Science Master's Programs in Partnerships with Industry

The National Research Council's July 2008 report both lauded the Professional Science Master's Degree and acknowledged its potential contribution to workforce enhancement across the nation.<sup>1</sup> A central theme of that report is a strategy already well underway in the California State University (CSU) systemwide PSM effort. Reflecting recommendations of the California Council on Science and Technology,<sup>2</sup> partnerships with industry are a cornerstone of the CSU's PSM programs. This strategy has relevance to graduate deans across the nation.

The California Council on Science and Technology was commissioned by CSU to undertake a comprehensive study of industry perspectives on the PSM. Its report, published in 2005, made four recommendations for establishing programs responsive to industry needs in the state's high growth science and technology sectors. These included biosciences and biotechnology, computer sciences and software, environmental sciences, nanotechnology, and telecommunications.

**Study Recommendation #1:** PSM programs must establish industry-wide credibility in order to be accepted. To accomplish this, the study advised CSU to initially support a limited number of programs in areas of substantial campus strength and to maintain a high level of quality control.

In response, the new PSM programs are focused on the bioscience and biotechnology sectors, with some additional programs in computational and environmental sciences. CSU has collaborated with the California Healthcare Institute (CHI), the primary California policy organization in the biomedical sector. With the PSM initiative as one of its priorities, CHI has recommended state support for PSM scholarships, featured PSM programs in a range of well-respected forums, and briefed members of California's Congressional delegation on the PSM.

Regional industry associations have also become partners in the CSU initiative. San Diego's BIOCOM, representing more than 550 member companies, is helping to publicize the PSM to policymakers and industry, as is the Southern California Biomedical Council (SoCalBIO), the major bioscience industry association in the Los Angeles basin.

**Study Recommendation #2:** In order to succeed, the PSM must accommodate industries where it is best suited, including (although not limited to) large multidisciplinary companies.

These large corporations generally need curricula that cover the range of disciplines relevant to the firms' work. CSU is focusing on breadth and flexibility responsive to this need. An example is found in the Program in Applied Biotechnology Studies (PABS), a four-campus PSM program

in the Los Angeles basin that draws on the strengths of CSU Dominguez Hills, Fullerton, Los Angeles, and Cal Poly Pomona. Approximately thirty faculty members from these four campuses developed PABS, resulting in a collaborative program with six interrelated concentration areas.

Large multidisciplinary firms in sectors with significant workforce demand typically are committed to staff retention. These firms frequently offer employee tuition reimbursement for PSM participation, and they need programs to be offered at times that accommodate employee work schedules. PSM delivery that allows for part-time graduate study at non-work times is necessary if programs are to respond to this industry need.

A pertinent example is Qualcomm, which has a sizable need for computer software experts with an understanding of wireless environments. Qualcomm is interested in delivery of part-time programs online and at its worksite—a delivery design to which CSU is prepared to respond and which reflects Qualcomm's strategically crafted learning and development policies.<sup>3</sup>

## Internships That Build on Industry Practices

A central need of small or large multidisciplinary firms is staff training in different areas of expertise, which PSM programs are ideally suited to provide. Corporations such as Mannkind—a leading pharmaceutical firm in the Los Angeles Basin—support undergraduate internships that give students early and varied experiences over a series of summers. Since internships like these provide a valuable pathway to the PSM, particularly for students from diverse backgrounds, CSU is establishing pre-PSM corporate internship partnerships.

Other internship models favored by CSU corporate partners may extend from six to twelve months. This design, with mentored, paid part-time positions, is utilized by BD Biosciences, a Fortune 500 firm in Santa Clara. To take advantage of a spectrum of corporate internships, most of which are paid, PSM programs need to allow options for students that range from summer programs to yearlong placements.

## Substantive Partnerships with PSM Employers

Employers typically seek genuinely substantive PSM partnerships. They want to partner with PSM programs that are responsive to their input in many areas, including candidate recruitment, employer tuition reimbursement, curriculum development, industry projects for study, well qualified guest lecturers and adjunct faculty, hosting of programs on-site, and ongoing feedback and evaluation. This broad set of interest conforms with the third California Council on Science and Technology recommendation.

**Study Recommendation #3:** Industry and universities need to develop deeper and more formal working relationships that go beyond collaboration through advisory boards.

One CSU approach involves Memoranda of Understanding (MOU's) with industry partners. Abbott's partnership with the PSM program in Medical Product Development Management at San Jose State University provides an excellent model for PSM industry partnerships elsewhere. The San Jose State-Abbott MOU includes: top-level Abbott representation on the program's Advisory Committee; two internships per year; employee participation through Abbott's employee tuition reimbursement program; two annual Abbott scholarships for other PSM students; and a gift by Abbott to help support program development.

**Study Recommendation #4:** Statewide partnerships should include the development of a high-level advisory board for the CSU Chancellor's Office.

A PSM Executive Board for the CSU systemwide program has been established that includes CEOs and presidents of leading science and technology firms in California. In addition to industry partners like Abbott, Qualcomm, and BD-Biosciences, the Board includes representatives of Cisco, Genentech, Hewlett Packard, Invitrogen, Pacific Gas & Electric, Pfizer, Sony, leading industry organizations, CSU Presidents, a member of the CSU Board of Trustees, and the Governor's Office.<sup>4</sup> Participation by the CSU Chancellor and campus presidents in annual meetings of the Executive Board ensures top-level CSU readiness to address recommendations of the Board.

### Governance Challenges

Being responsive to industry-defined needs may pose challenges that need to be addressed openly in the governance of PSM programs. As with other successful campus collaborations or with commercial partnerships, from the outset roles and expectations must be well understood and clearly communicated.

*Recognition of the university responsibility.* Thoughtful industry partners will appreciate a basic tenet that needs to be explicitly on the table. This is the fundamental responsibility that universities embody for ensuring quality in graduate education. Value is assured by highly reputable institutions through established decision-making processes of faculty and administrators who are committed to and held accountable for quality. It matters especially that degrees are involved.

*Maintenance of the public character of programs.* Industry partners will understand that public universities must make their programs available to all enrolled students, irrespective of their employment. This involves fairness in access to scholarships, other support, projects and internships, and in examining for which students it may be convenient (or inconvenient) to have specific classes offered at a particular time or at a work site.

*Faculty determination of learning outcomes.* Basic learning goals are appropriate subjects for external input in

conversations between and among industry and faculty representatives. But faculty must retain ultimate decision-making for classroom and laboratory activities and, while internships and industry-generated projects should be substantially shaped by industry input, faculty need to be the final judges of these as well.

*Setting boundaries independent of corporate contributions.* Every university advancement officer, university provost, and dean has experienced the tension more than once: gift recipients want "no strings attached" and donors want value for investments. Our advice here is to recognize this inevitable tension and to be confident that industry partners who make contributions will respect necessary boundaries campuses must establish associated with gifts.

### Concluding Perspective

The PSM stands ready for large-scale expansion nationally: 1) chancellors and presidents are seeking ways of better addressing their states' economic development needs; 2) campuses are seeking to engage more diverse students in science, technology, and mathematics fields at all levels; 3) students in these fields are seeking graduate training that provides promising career opportunities; and 4) Congress is poised to finance PSM growth.

Crafting appropriate, productive, and mutually beneficial university/industry relationships for the PSM is a singularly important task. The effort is considerable, but the energy, commitment, and good will extended by both sectors will yield a foundation for long-term program success.

*By Keith Boyum, Associate Vice Chancellor, Academic Affairs, and Joan Bissell, Program Director, California State University. The authors wish to thank Sheila Tobias for her thoughtful review and comments.*

### Notes

<sup>1</sup>*Committee on Enhancing the Master's Degree in the Natural Sciences, National Research Council, Science Professionals: Master's Education for a Competitive World* (Washington, DC: The National Academies Press, 2008). [http://books.nap.edu/openbook.php?record\\_id=12064&page=R1](http://books.nap.edu/openbook.php?record_id=12064&page=R1) (Accessed July 20, 2008).

<sup>2</sup>*California Council on Science and Technology, An Industry Perspective of the Professional Science Master's Degree in California: Prepared for the California State University System*, January 2005 <http://www.ccst.us/publications/2005/2005PSM.php> (accessed July 20, 2008).

<sup>3</sup>Elkeles, Tamar and Philips, Jack, *The Chief Learning Officer: Driving Value Within a Changing Organization Through Learning and Development*, London: Elsevier, 2007.

<sup>4</sup>Additional information is available at <http://www.calstate.edu/psm>.