STRATEGIC REPORT FOR PROFESSIONAL MASTER'S DEGREES AT PENN STATE

Submitted to Eva Pell, Dean

The Graduate School

The Pennsylvania State University

by

The Task Force on Professional Master's Degree

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Preface

Dean Eva Pell empanelled the task force to review the state of professional master's degree programs in the United States and at the Pennsylvania State University. In doing so, she asked the task force to take into account the different markets that might influence the content, delivery mechanisms, and models of professional degrees at different Penn State campuses, and in particular Great Valley, Harrisburg and University Park. The task force was asked also to consider different financial models. This consideration assumed that most students accepted to professional master's degree programs are self-funded through various means.

For the sake of this report, the terms "professional" and "applied" master's degrees are treated synonymously and distinct from "traditional" master's degrees. The latter degrees are preparatory for doctoral study, including the M.A. and M.S., whereas the former are practice-focused and preparatory for nonacademic employment. They typically are considered terminal degrees. Longstanding examples of professional master's degrees include MBA, MFA, MSW, M.Ed., and MEng. In 2006, Penn State adopted the degree title of Master's of Professional Studies (MPS) to designate degree programs leading to nonacademic employment where a longstanding degree title does not exist, providing explicit recognition of the growth potential for professional master's programs.

Professional master's degrees often are required for entry-level employment where employees must possess a high-level understanding of disciplinary or interdisciplinary knowledge. Consequently, professional master's programs, more so than traditional master's programs, intersect the integration between knowledge creation and knowledge application. They also frequently involve industry and regional representatives on advisory boards to shape curricula and provide networks for graduates, as well as lead to community-based research by faculty. In the process, professional master's programs become potential avenues for regional innovation and economic development.

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Executive Summary

As globalization marches forward, more employers and governments around the world will be seeking highly skilled professional employees. For the foreseeable future, high-skilled professional jobs will require post-baccalaureate professional education in the form of certificates and master's degrees.   As the global demand for high-skilled professional employees heightens, the lack of capacity to meet that demand in certain parts of the world, including China, India, and Latin America, point to a ripe opportunity for the Pennsylvania State University. The University, therefore, should expand the number of professional master's degree programs it offers, especially at Penn State Great Valley and Penn State Harrisburg. A prime consideration when remodeling existing master's programs, or creating new professional master's programs, should be establishing sustainable regional and international partnerships with other educational institutions as well as organizations in the public and private sectors.

The following constitute the committee's recommendations for advancing an agenda to enlarge the University's portfolio of professional master's degree programs.

The Graduate School should take an active role in promoting new professional master's degree programs.

The University should adopt a resident tuition revenue sharing arrangement to incentivize programs and faculty to develop new professional master's degree programs.

Given Penn State Great Valley's prime location, specialized campus mission, and the anticipated national growth in demand for graduates with professional master's degrees, the campus should be encouraged to expand its program offerings in innovative and blended ways.

The University should evaluate the potential value of adding more PSM programs before such programs are adopted.

Delivery modes of new programs should be flexible, with the need for blended, online, or face-to-face delivery to be determined by the program.

Programs should develop IUG-type opportunities for their own undergraduate students, as well as for undergraduates from other Penn State campuses and regional institutions.

The University should encourage programs to establish collaborative professional master's programs with foreign institutions.

Introduction

Over the past decade, increasing national attention has been focused on the need for more graduates of professional master's degree programs. [1] For example, the Alfred P. Sloan Foundation began promoting the Professional Science Master's (PSM) Initiative in 1997, and presently about 120 PSM programs exist at 62 universities in the United States. (Penn State developed three PSM programs with Sloan support: Applied Statistics, Biotechnology, and Forensic Science). Other national organizations subsequently joined the movement to promote more university-based professional master's degree programs.

In 2005, the Council on Competitiveness released the report: "Innovate America." The report portrays holders of professional master's degrees as essential to the economic and political well-being of the United States. In 2006, the Council of Graduate School's released *Professional Master's Education: A CGS Guide to Establishing Programs.* The publication outlines potential requirements, examples of best-practice programs, and suggestions for including relevant stakeholders in the creation of professional master's degree programs and related advisory boards.

In 2007 the movement to promote more university-based master's degrees received additional momentum from three significant events. First, the Council of Graduate School's (CGS) released the report "Graduate Education: The Backbone of American Competitiveness and Innovation." The report calls for collaborative efforts among universities, industry, and government to enhance and augment a high-skilled

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[1] To be sure, a great deal of international attention has been trained on this subject as well.

professional workforce in the United States.   To foster this growth, the report explicitly

calls for universities to promote faculty scholarship tied to community and industry

needs, for industries to work more closely with graduate educational institutions on joint

ventures to fashion the new interdisciplinary professional degrees, and for federal and

state governments to fund more professional master's degree programs and graduate

students in those programs. The CGS report is poignant because it points to the

importance of linkages and partnerships among universities, industry, and government in

promoting professional master's programs. Viewed more broadly, Arbo and Beeneworth

(2007) concluded after an exhaustive literature review that universities serve an

integrative capacity capable of joining regional, national, and international interests

around innovation, teaching, and research. Professional master's programs, then, serve

as one integrative mechanism for sustained economic and social developments, a point

echoed throughout the 2006 CGS guide to professional master's education. Second, the

US Congress passed and President Bush signed the America Competes Act that directs

Congress to fund initiatives to stimulate the supply of graduates with professional

master's degrees. Third, the National Professional Science Master's Association was

formed to create a network among universities and scholars sponsoring PSM degrees.

Early in 2008, *Science Magazine* (Rhodin: 2008) contained an article titled

"Mastering the Job Market" in which the author cites evidence that the growing demand

for graduates with professional master's degrees, PSM degrees in particular, is coupled

with rising starting salaries for recent graduates. Effectively, this article represents a

capstone to a decade of effort to promote professional master's programs by pointing to a

rising demand for graduates with these degrees and the willingness by employers to pay

the price to attract them. Given this ongoing social movement to promote professional master's degree programs, the Pennsylvania State University should look strategically at what role it will play as the movement goes forward.

Inventory of PSU Master's Programs

At present, the Pennsylvania State University offers 83 professional master's degree programs at four academic campus locations plus the World Campus (see Table 1 for overview and Appendix A for details).   As of March 2008, however, only eleven administrative units system-wide were in the planning phase of developing new professional master's programs (see Table 2), and two other units were considering the prospects of adding a professional master's program: biochemistry and molecular biology, and bioengineering.

Since the year 2000, PSU enrollments in residential master's programs system-wide declined from a high of 5,338 in 2001 to 4,477 in 2007, a 16.2% enrollment drop. University Park enrollments dropped 17.6% between 2000 and 2007, with its peak enrollment occurring in 2000.   (See Figure 1 for a history of resident campus enrollments from 2000 to 2007.)

The Penn State Great Valley campus saw the most dramatic decline in enrollments, experiencing a 27% drop between 2000 and 2007. Enrollments peaked in 2001 and have declined 32% since that year.   Nevertheless, Penn State Great Valley enrollments averaged approximately 27% of the total University annual resident enrollment in master's degree programs, traditional and professional combined, though its enrollment share declined gradually over the 2001-2007 time period. The Penn State Harrisburg Campus experienced a 15% gain in enrollment between 2000 and 2007, with

its peak enrollment coming in 2005. It has experienced a 12% drop since 2005. Still, Harrisburg averaged approximately 30% of the total University annual resident enrollment in master's degree programs, traditional and professional combined, from 2001 to 2007. Given that over 50% of the total University resident master's enrollments originate at Great Valley and Harrisburg, both locations represent key elements in the graduate program portfolio of the University.

Table 1: Number of Professional Master's Degrees by Campus Location*

| Location	Number of Degrees
Erie	2
Great Valley	8
Harrisburg	11
University Park	54
Programs delivered via World Campus	14

*See Appendix A for a complete listing of professional degrees offered by Penn State.

Table 2: Programs in the Planning Stages of New Professional Master's Degrees

Academic Unit	Campus	Tentative Degree Title
Civil and Environmental Engineering-	University Park	Master of Engineering in Construction Management
Criminal Justice	Harrisburg and UP	Masters in Criminal Justice (via World Campus)

Crop and Soil Sciences	University Park	Master of Professional Studies in Turf Grass Management (via World Campus)
Electrical Engineering	University Park	Master of Engineering in Electrical Engineering
Great Valley Education Division	Great Valley	Master of Education in Teaching English as a Second Language
Great Valley Education Division	Great Valley	Master of Education in Math Education
Great Valley Engineering Division	Great Valley	Master of Engineering Management
Health Evaluation Sciences	Hershey	Master of Public Health
School of Nursing **(Two professional degrees considered)**	University Park	Currently examining an MSN(with a focus on advanced practice) and DNP(a new clinical doctorate endorsed by national professional organizations)
Science, Technology and Society **(which also administers the Bioethics and Medical Humanities Program at UP)**	University Park	Master's in Biomedical Ethics (Note: Biomedical is a narrower field than bioethics; the latter includes the former, but also addresses other topics such as environmental ethics, food research ethics, etc. A dual title Ph.D. degree program in bioethics is also being considered.
Workforce Education and Development	University Park	Master's of Professional Studies in Workforce Education and Development

Figure 1: Fall Enrollments in Resident Master's Programs by Campus Location, 2000 – 2007*
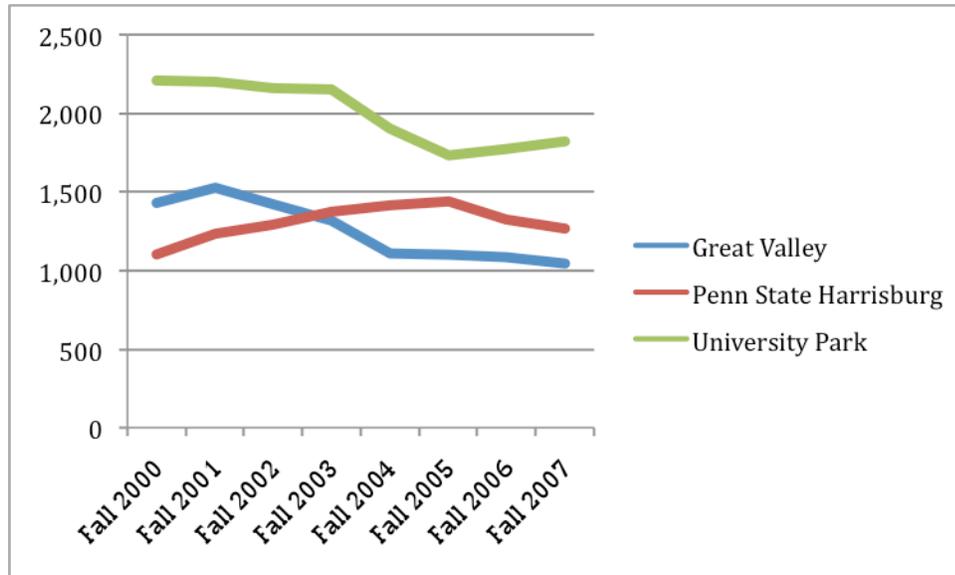
*Source: Official Enrollment Data, The Graduate School

Meanwhile, the World Campus now delivers 14 professional master's programs for various academic units, with growing enrollments. From 2006 to 2007, enrollment in professional master's degree programs delivered via the World Campus grew 23.5%, from 1,967 to 2,429, whereas the 2007 enrollments in World Campus professional master's programs were six times the 2001 enrollment level. World Campus accounted for 20% of the total university master-level enrollments in 2007.[2] Clearly, the World Campus represents a growth opportunity for delivering professional master's programs.

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[2] The World Campus enrollment data were not comparable to resident instruction enrollment data until fall 2007.

Recommendations

Except for Penn State Great Valley and Penn State Harrisburg, the small number of academic units contemplating the development of professional master's degree programs appears to represent a marginal interest for offering more programs. The low level of interest might have two prime sources: 1) a preference on the part of graduate faculty toward doctoral education and 2) a lack of incentives to motivate new resident master-level programs (see also CGS 2006).

Faculties associated with doctoral programs presently are fully extended, and therefore, tend to perceive professional master's degree programs from a negative viewpoint. Professional master's programs represent time investments with fewer perceived outcomes directly benefiting graduate faculty, compared to traditional master's programs that lead to doctoral study. This viewpoint occasionally becomes paired with other viewpoints that appear more prejudicial than substantive, namely the perception that students enrolled in professional master's programs are less talented than their peers in traditional programs, or that their presence in the classroom diminishes the quality of instruction for traditional graduate students. Thus, expanding the number of professional master's degree programs across the University will require leadership coupled with new incentives.

The Graduate School should take an active role in promoting new professional master's degree programs.

Significant spontaneous growth of professional master's degree programs is unlikely to occur simply through grass roots efforts on the part of individual faculty and their departments. The Graduate School will need to provide leadership in this arena if

serious expansion in professional master's programs and associated enrollments is to occur. To provide strategic leadership, the Graduate School should work collaboratively with other units of the University, particularly those from Outreach (CGS 2006). Specifically, Outreach Marketing as well as the Office of Economic and Workforce Development (OEWD) should be partners in this effort. Both units have resources that would prove useful in sorting through online opportunities as well as identifying partnerships internally and externally to the University. The OEWD especially brings potential to link different campus initiatives with regionally based interests, thereby directly linking the research and instruction missions of the university with the service mission.   Indeed, compared to the longstanding professional degrees such as the MBA and M.Ed., more recently created professional master's degrees, including MPSs and PSMs, tend to represent interdisciplinary innovations focused on substantive concerns, potentially making the outreach mission of the University a significant and integrated element of the academic mission going forward.

The Office of Client Development from Outreach likewise would be an important resource when looking to establish professional master's programs with companies. The relationship among the Smeal College of Business, Saudi Aramco, and the World Campus represents an excellent example of how the Office of Client Development can foster corporate partnerships that portend sustainable and enlarging portfolios. The initial partnership involved Saudi Aramco employees taking the Smeal Graduate Certificate Program in Supply Chain Management. This 12-credit program involved a blended format, part online instruction and part resident instruction in Saudi Arabia. From that initial engagement, several employees now are enrolled in the iMBA program, a second

cohort for the Supply Chain Management certificate has been arranged, and interest has been expressed to add two other MPS programs to the client portfolio.

Important recent mechanisms introduced by the Graduate School should facilitate the promotion of professional master's programs, whether delivered as resident, distributed, or blended format. First, the Graduate School recently introduced 800-level course numbers designed largely for professional degree curricula. While 800-level courses represent the same quality of graduate rigor and credit as 500-level courses, the 800-level designation allows programs to provide graduate credit for course work without requiring perquisites, such as a bachelor's degree in the major field, typical of 500-level course work. Importantly, discussion of theory and research remain essential content of 800-level courses. Second, the Graduate School also established a new category of graduate faculty, called Form C. Form C graduate faculty do not need the highest degree in their field to qualify for graduate faculty status. They are approved to teach only 800-level courses, and they are not allowed to advise students. Hiring qualified fixed-term faculty could be an effective alternative to engaging reluctant Form A faculty to support professional master's programs. These strategic developments provide more degrees of freedom necessary for the creation and maintenance of new professional master's degree programs at the University.

The University should adopt a resident tuition revenue sharing arrangement to incentivize programs and faculty to develop new professional master's degree programs.

Lack of incentives represents a second challenge to creating more professional master's degree programs. At present, only the World Campus offers departments and colleges a monetary incentive to expand professional master's program opportunities.

The World Campus offers four different gross revenue sharing schemes with colleges: 90/10, 50/50, 34/66, and 10/90, where the first number reflects the World Campus portion of the tuition revenue. The 50/50 arrangement seems most popular and colleges in turn share their half with the academic units administering the programs.

Sharing tuition revenue generated from professional resident master's programs is encouraged by CGS (2006) as an incentive, provided undergraduate and traditional graduate student enrollments are not declining or negatively impacted by the addition of a professional program. Indeed, the shared revenue from additional professional master's programs potentially would benefit programs, colleges/campuses, as well as the University. A well-structured incentive program could provide colleges/campuses with resources needed to expand professional master's degree programs into the strategic areas targeted by the mechanisms described in the prior recommendation. Shared revenue also would enable more top ups for graduate recruitments and more general support for graduate students in traditional graduate programs. Additionally, colleges that currently receive workload monies from the Office of the Provost to support graduate teaching assistants for undergraduate instruction might well have reduced demand for workload monies if resident tuition generated by professional master's programs was shared.

At other institutions, such as Stanford University, engineering programs have taken advantage of the willingness of students to fund themselves for master's degrees. (See Appendix C for enrollment data in select engineering master's programs by institutions with the highest enrollments.) The Stanford Department of Electrical Engineering strategically opened its master's program to self-funded students and enrolled 427 master's students during the 2006/07 academic year compared to 492

doctoral students.   Stanford University, however, shares a percentage of the resident tuition revenue from master's programs with the academic units involved. The Task Force did not learn about the terms and conditions of this sharing model.

At PSU, the Department of Electrical Engineering at University Park estimates 50 of its international applications per year represent a potential market for a customized professional master's degree. The potential international markets in general contain large numbers of self-funded students.   The department believes it could offer a course-credit degree program to tap this market, but lacks incentive to push forward with the idea because of the anticipated additional workload for faculty.

The anticipated program would involve primarily lecture courses with a capstone course as the culminating experience and could be completed in 12 months. Assuming a 12-month program where the University offered a 50/25/25 split, with the University keeping 50% while the college and the department split the remainder, the addition of 50 international students would yield $311,250 to the department and the same amount to the college for a 30-credit program. The University, meanwhile, would yield $622,500 from the tuition of those additional 50 international students in an electrical engineering professional master's program. If a new professional master's program in electrical engineering required hiring two new fixed-term faculty at $70,000 per year, the department would yield no less than $170,000 from the same 50 students. However, this scenario also assumes all 50 additional students pay out-of-state tuition. The same example based on all 50 professional master's students paying in-state tuition would yield the department approximately one-third as much additional revenue. The three scenarios discussed here represent the theoretical situations of a 50/25/25 resident tuition

revenue sharing model and illustrate the potential gains from additional self-funded enrollments in professional master's programs.

Given Penn State Great Valley's prime location, specialized campus mission, and the anticipated national growth in demand for graduates with professional master's degrees, the campus should be encouraged to expand its program offerings in innovative and blended ways.

The stated mission of Penn State Great Valley emphasizes offering innovative opportunities for lifelong learning through graduate and professional programs. The Great Valley campus seems ideally situated for this mission and should reinforce its existing professional master's programs, while building new ones, in order to regain its enrollment share. A fresh assessment of its existing regional partnerships, as well as it relationship with World Campus, should be encouraged. The OEWD also would be well positioned to support a focused effort that integrates research and professional educational opportunities for regional innovation and competitiveness.

Examples of new programs include working with employers having a global reach to deliver cohort-based certificates and degree programs that involve online delivery as well as a US immersion component at the Great Valley campus. Other possibilities include establishing partnerships with regional institutions of higher education in order to integrate undergraduate programs at these institutions with graduate degree opportunities from Great Valley.

Finally, the Great Valley and Harrisburg campuses should consider ways to tap synergies between their faculties and program offerings in order to take advantage of their anchoring points in eastern Pennsylvania. Perhaps these initiatives could be modeled after the iMBA program, which is jointly administered by several campuses and

delivered through the World Campus.

The University should evaluate the potential value of adding more PSM programs before such programs are adopted.

The US Office of Postsecondary Education has announced that the Fund for the Improvement of Postsecondary Education--Comprehensive Program will give priority to institutions seeking to improve or expand PSM programs in the STEM fields (http://www.tradingmarkets.com/.site/news/Stock%20News/1232681/).   Additionally, the Alfred P. Sloan Foundation has launched a new initiative to support campus-wide and system-wide developments of PSMs rather than individual programs.   (See Appendix B for a list of current PSM programs.) Given these new funding initiatives to support the growth of PSM offerings, and the apparent brand recognition of the title, the question moving forward will be the degree of commitment from the University to encourage such programs.

Recently, the University of Illinois at Urbana-Champaign received funding from Sloan to develop campus-wide programs; the UIUC graduate school directs the program. To date, system-wide adoptions have occurred at the California State University System and the University of North Carolina System. The State University of New York System has expressed an interest in a system-wide adoption of specific PSM programs.

Penn State could pursue either the campus-wide or system-wide option. With three PSM programs currently offered at University Park, a campus-wide adoption of PSM would mean at least five additional PSM programs. However, a system-wide option that would include Great Valley, Harrisburg, Hershey, and University Park seems equally feasible, depending on the specific program. The committee recommends an

evaluation be conducted of each option, campus-wide and system-wide, to determine which, if either, would be most valuable to the University over the next 5-7 years.

Delivery modes of new programs should be flexible, with the need for blended, online, or face-to-face delivery to be determined by the program.

Because the market populations interested in professional master's degrees are more likely to be older than traditional master's students and have community ties in a particular location, the delivery mechanisms for these degree programs must be flexible. Domestic populations in particular are less likely to relocate for a two-year residential master's program, while international populations might be very willing to relocate for a portion of a program. That said, many more potential international students could be as location bound as potential domestic students.

New Penn State opportunities, including those requiring laboratory or hands-on experience, might be most attractive if offered as 1.5 year executive-style programs consisting of online courses coupled with some resident-based instruction. Similarly, certain types of programs involving cohorts from employers with international and domestic employees also could involve immersions of students into different countries as part of employers' normal rotation requirements.

The Committee raised a question about how enrollments are counted when academic units partner with the World Campus. Enrollment counts become a particular concern when a college's/campus' online delivered credit hours are included in the resident portion of the University's workload model. While programs and courses offered via the World Campus are supported through tuition collected by the World Campus and academic units benefit in the form of revenue sharing, the Committee heard

expressions of concern that enrollment reports involving the World Campus might disadvantage campuses/colleges in terms of their budgets. At the same time, the Committee notes some colleges, such as the College of the Liberal Arts, appear to have established very effective working relations with the World Campus. Probably the biggest concern involves registration situations where students are enrolled for courses through the World Campus and simultaneously through a residential campus. The Committee, therefore, recommends that any concern regarding World Campus's fees for delivering online courses and programs be addressed at the level of the University Budget Office.

Programs should develop Integrated Undergraduate Graduate (IUG)-type opportunities for their own undergraduate students, as well as for undergraduates from other Penn State campuses and regional institutions.

More professional master's degree programs should be created as IUGs, or IUG-type models, with related undergraduate programs. Penn State undergraduates represent a vast pool of potential applicants to professional master's programs, and that pool should be tapped.

Interestingly, the committee discovered that Penn State Abington and Penn State Brandywine have developed graduate partnerships with Thomas Jefferson University. The Penn State Abington partnership enables undergraduates to take courses in preparation for master's and doctoral degree opportunities in occupational therapy, biotechnology, clinical health psychology and physical therapy. Students at Penn State Brandywine have master's degree opportunities at Thomas Jefferson University in nursing, occupational therapy, radiologic sciences, bioscience technologies, physical therapy, pharmacy, and couple and family therapy. Penn State Lehigh Valley, the

committee learned, has a longstanding partnership with the University of Turabo in Puerto Rico to offer an M.Ed. in English as a Second Language (ESL) on the Lehigh Valley campus.

At minimum, these partnerships represent lost opportunities for Penn State to attract good students living in the regions surrounding Penn State Harrisburg and Penn State Great Valley. These two campuses should be encouraged to investigate and develop similar arrangements with regional Penn State campuses and other regional institutions. The partnerships with Thomas Jefferson University and the University of Turabo suggest Penn State has been slow to recognize the growing demand for professional master's programs from its own undergraduate students at the various campuses.

The University should encourage programs to establish collaborative professional master's programs with foreign institutions.

Departments and colleges (campuses) should consider program partnerships with foreign institutions that involve exchanges of cohorts of students and faculty in order to include an international immersion for domestic and international students. While the University is reluctant to establish a physical presence in foreign countries, the opportunity to deliver professional master's programs internationally continues to expand. Numerous examples exist nationally. These arrangements could be fashioned after a 3 + 2 IUG model, where students would complete three years of a bachelor's degree in their home country with the idea of entering a PSU graduate integrated program in the United States for the final two years.

Examples of potential opportunities currently exist at Penn State. At the University Park campus, for example, the Smeal College of Business engages in a variety of international executive programming that has eventuated in collaborative agreements to offer professional master's programs in various formats. Another example involves eight Commonwealth Campuses and two universities in India. The campuses signed agreements with the two universities to provide a 2 + 2 experience. Students at the Indian universities complete two years of their bachelor's degrees in India, followed by two years on one of the eight Penn State campuses where they will earn their bachelor's degrees in IST. Fall 2008 marks the arrival of the first cohort of ten students at the York campus, to be followed in subsequent years by cohorts of 20. These Indian students represent an opportunity as potential recruits into the IST graduate programs at University Park and the information science program at Great Valley.

To be sure, as the University moves forward with its efforts to internationalize programs and curricula, similar opportunities will emerge. The committee firmly believes the international arena represents a sizeable market for self-funded professional master's students that should be strategically developed.

Conclusions

As globalization marches forward, more employers and governments around the world will be seeking highly skilled professional employees. For the foreseeable future, high-skill professional jobs will require post-baccalaureate professional education in the form of certificates and master's degrees. As the global demand for highly skilled professional employees heightens, the lack of capacity to meet that demand in certain parts of the world, including China, India, and Latin America, point to a ripe opportunity

for the Penn State. The University, therefore, should expand the number of professional master's degree programs offered at its graduate campuses, especially Penn State Great Valley and Penn State Harrisburg.

The Graduate School has made significant changes to facilitate expanding the professional master's portfolio, adding Form C faculty and 800-level course numbers. Additionally, it introduced the new degree title Master's in Professional Studies to standardize new program offerings. Now, the Graduate School should extend its leadership role to systematically look for new opportunities. In this regard various offices from Outreach Programs would be worthy partners.

Departments and programs also should think broadly about developing professional master's programs. Increasingly, professional master's programs are customized to fit specific niche needs, for example a particular global employer, while at the same time certain professional master's programs could easily be fashioned from existing traditional master's programs but delivered in an executive-style format. Departments and programs should be encouraged to utilize the IUG format as well, in order to capture the demand from Penn State undergraduate students.

Equally important, Penn State graduate centers should be encouraged to reach out to Penn State Commonwealth Campuses and other institutions of higher education, including foreign universities, to establish sustainable partnerships and pipelines for professional master's students. Penn State Great Valley especially should not watch quality opportunities migrate to other regional institutions, especially when its enrollments are sagging.

Because of the importance of heading off competition, new and revised professional master's programs must be flexible in the delivery and program structures and nimble when bring the programs to the public. Clearly, the World Campus will play a larger role going forward in delivering professional master's program. Additionally, programs, when appropriate, should include opportunities for international immersion, whether for international students coming to the Unites States or domestic students experiencing a foreign environment.

Funding new initiatives remains a key stumbling block for expanding the number of professional master's programs. The committee recommends the University devise a resident tuition revenue sharing plan to increase enthusiasm and thereby nudge colleges and departments toward future investment. Whether a 50/25/25, where a college and department receive 25% each, or some other tuition-sharing model, an equitable incentive scheme for motivating departments to develop professional master's degree programs should be given high priority in the University budgeting process.

Finally, professional master's degree programs represent a means by which the University can connect directly to a service population. As faculty formulate plans for professional master's degree programs, they should take into account the interests of the stakeholders that will hire the graduates of the programs. Involving stakeholders on program boards creates conduits for knowledge transfer regionally as well as globally, thus contributing to Penn State's reputation as an academic leader in today's world.

References

Arbo, Peter and Paul Benneworth
      2007 Understanding the Regional Contribution of Higher Education Institutions:
          A Literature Review. Organisation for Economic Co-operation and
          Development: Paris.

Council on Competitiveness
      2005 "Innovate America: National Innovation Initiative Summit and Report:
          Thriving in a World of Challenge and Change. Council on
          Competitiveness: Washington, D.C.

Council of Graduate Schools
      2006 Professional Master's Education: A CGS Guide to Establishing Programs.
          CGS: Washington, D.C.

Council of Graduate Schools
      2007 "Graduate Education: The Backbone of American Competitiveness and
          Innovation." CGS: Washington, D.C.

Rhodin, Amy
      2008 "GW One of the First to Offer Professional Science Degree." *Science
          Magazine,* February 7.

Appendix A

Current Professional Master's Degree Offerings by Program and Campus Location*

Acoustics
Adult Education
Adult Education (University Park offered via World Campus)
Aerospace Engineering
Agricultural & Extension Education
Agricultural, Environmental & Regional Economics
Agronomy
Animal Science
Applied Statistics
Architectural Engineering
Architecture
Art
Art Education
Biotechnology
Business Administration (iMBA – joint offering via World Campus)
Business Administration (MBA - Executive)
Business Administration (MBA - Great Valley)
Business Administration (MBA - Harrisburg)
Business Administration (MBA)
Civil Engineering
College Student Affairs
Community & Economic Development (University Park via World Campus)
Computer Science & Engineering
Counselor Education
Crime, Law & Justice
Curriculum & Instruction
Curriculum & Instruction (Great Valley)
Curriculum & Instruction (University Park via World Campus)
Earth Sciences (University Park via World Campus- eff. 2008)
Educational Leadership
Electrical Engineering (Harrisburg)
Engineering Management (Harrisburg)
Engineering Mechanics
Engineering Science (Harrisburg)
English
Entomology
Environmental Engineering
Environmental Engineering (Harrisburg)
Environmental Pollution Control
Environmental Pollution Control (Harrisburg)

Finance (Great Valley)
Forensic Science
Forest Resources
Geographic Information Systems (University Park via World Campus)
Health Administration (Harrisburg)
Health Education (Harrisburg)
Health Policy & Administration
Higher Education
Horticulture
Human Nutrition
Human Resources and Employment Relations
Human Resources and Employment Relations (University Park via World Campus)
Industrial Engineering
Instructional Systems
Instructional Systems (Great Valley)
Instructional Systems (University Park via World Campus)
International Affairs
Landscape Architecture
Leadership Development (Great Valley)
Leisure Studies
Mathematics
Mechanical Engineering
Music - Composition and Theory
Music - Conducting
Music - Music Education
Music - Performance
Music - Piano Pedagogy and Performance
Music - Voice Performance and Pedagogy
Nuclear Engineering
Oil and Gas Engineering Management (University Park via World Campus)
Physics
Plant Pathology
Project Management (Behrend via World Campus)
Public Administration (Harrisburg)
Public Health Preparedness (University Park via World Campus)
Quality & Manufacturing Management
Rural Sociology
School Psychology
Software Engineering (Great Valley)
Soil Science
Special Education
Special Education (Great Valley)
Supply Chain Management (University Park via World Campus)
Systems Engineering (Great Valley-effective 2008 via World Campus)
Teaching and Curriculum (Harrisburg)
Theatre

Training and Development (Harrisburg)
Wildlife & Fisheries Science
Workforce Education & Development
Youth & Family Education

* Programs without a campus location in parenthesis originate at University Park.

Appendix B

Titles of Existing PSM Degree Programs by Major Field

Biotechnology/Biology Programs

o   MS in Applied Sciences: Biotechnology
o   MS in Biotechnology and Bioinformatics
o   MS Biotechnology/MBA Dual Degree
o   Professional Master's Degree in Biotechnology
o   Entrepreneurial Biotechnology
o   Professional Master's Degree in Molecular Biotechnology
o   MS in Cell and Molecular Biology
o   Master of Biology
o   Master of Bioscience (MBS):
   • Bioprocessing
   • Business of Bioscience
   • BioIndustry Ethics
o   Masters of Science in Professional Science (MS-PS): Biotechnology
o   Master's of Microbial Biotechnology (MMB)
o   PSM in:
   • Biotechnology
   • Marine Biology
o   PSM in Applied Biotechnology
o   Master of Biotechnology
o   MS in Biological and Pharmaceutical Biotechnology
o   Professional Masters Degree in Applied Biosciences
o   Professional Master's Degree in:
   • Applied Genomics
   • Microbial Systems Analysis
o   Master of Professional Studies: Biotechnology
o   Master of Science in Biotechnology Studies
   • Specialization in Bioinformatics
   • Specialization in Biotechnology Management
   • Specialization in Biosecurity and Biodefense
o   MS in Science and Entrepreneurship (SAE)

Chemistry Programs

o   Master of Analytical Chemistry
o   Master of Materials and Chemical Synthesis
o   Chemistry for Entrepreneurship
o   Computational Chemistry
o   Applied Chemistry and Biochemistry PSM

Computational Molecular Biology/Bioinformatics Programs

- MS in Bioinformatics
- Medical and Bioinformatics MS
- Professional Master of Science in Bioinformatics
- Professional MS in Biomedical Informatics
- Masters Program in Chemical Informatics
- Professional Science Masters in Bioinformatics
- Master's Program in Bioinformatics and Computational Biology
- Master of Bioinformatics

Computer Sciences Programs

- MS in Applied Science: Applied Computing
- Master of Science in Information Systems
- Master of Science in Human-Computer Interaction
- Master of Integrated Science and Technology
- MS in Computer Science and Information Systems
- Master of Science and Technology

Environmental Sciences Programs

- MS in Applied Science: Environmental Assessment
- PSM: Environmental Sciences Option
- Ecological Economics
- Food Safety and Toxicology
- PSM in Environmental Sciences
- Professional Master of Science in Environmental Analysis and Decision-Making
- Environmental Science Management
- MS in Environmental Management
- Ecosystem Management
- PSM: Geographical Information Systems and Remote Sensing
- Master of Science and Technology (MST): Environmental Science
- Professional Master's Degree in Environmental Monitoring

Forensic Sciences Programs

- Master of Science in Forensic Science
- Master's in Forensic Science
- Forensic Chemistry

Mathematics and Statistics Programs

o   MS in Mathematics: Entrepreneurship Track
o   MS in Quantitative and Computational Finance
o   Biostatistics
o   MS in Industrial Mathematics
o   Master of Financial Mathematics
o   Master of Applied Statistics
o   Professional Master's Degree in Mathematical Sciences
o   Professional Master's Degree in Applied Financial Mathematics

Medical-Related Sciences Programs

o   MS in Genetic Counseling
o   MS in Prosthetics and Orthotics
o   Master of Bioscience in:
   •   Medical Devices and Diagnostics
   •   Pharmaceutical Discovery and Development
   •   Clinical and Regulatory Affairs

o   Biomedical Laboratory Operations
o   PSM in Integrative Pharmacology
o   PSM:Drug Analysis
o   Applied Genomics

National Defense Programs

o   PSM in Combating Weapons of Mass Destruction
o   MS in Biotechnology Studies: Biosecurity and Biodefense Specialization

Physics and Geological Sciences Programs

o   PSM in engineering Physics
o   Master of Health Physics
o   MS in Physics: Entrepreneurship Track
o   Master of Professional Studies: Physics
o   PSM in Applied Physics
o   Professional Master of Science in:
   •   Nanoscale Physics
   •   Subsurface Geoscience

o   Applied and Industrial Physics
o   Professional Master's Degree in Physics Technical Management

- Science Instrumentation

Appendix C

Top Engineering Enrollment in Maters Programs in 2006

(Source: American Society for Engineering Education - ASEE)

Electrical Engineering

Institution	Total MS	Foreign total = FT + PT		% foreign (FT+PT)
University of Southern California	589	345	= 235 +110	58.6%
Stanford	456	266	= 199 + 27	49.6%
Arizona State University	354	215	= 192 +23	61%
Illinois Institute of Technology	305	263	= 245 + 18	86%
Polytechnic University	271	135	= 121 + 14	49.8%
New Jersey Institute of Technology	262	199	= 177 + 22	75.9%
Penn State	**84**	**51**	**= 41+10**	**60.7%**

Computer Science

Institution	Total MS	Foreign total = FT + PT		% foreign (FT+PT)
University of Southern California	620	463	= 331 + 132	74.4 %
The Johns Hopkins University *	549	52	= 37 + 15	9.5%
The University of Texas at Dallas	339	245	= 188 + 57	72%
Columbia University	216	114	= 70 + 44	53%

Stanford	215	74 = 63 + 11	34.4%
Arizona State University	208	148 = 127 + 21	71%
Penn State	**53**	**33 = 29 + 4**	**62%**

* The Johns Hopkins has 320 (71%) domestic part time MS.

Mechanical Engineering

Institution	Total MS	Foreign total = FT + PT	% foreign (FT+PT)
Georgia Institute of Technology *	390	81 = 64 + 17	21%
Stanford	315	93 = 89 + 4	28%
University of Michigan	245	138 = 135 + 3	56%
Texas A&M University	220	116 = 108 + 8	53%
Wayne State University	161	123 = 108 + 15	79 %
University of Southern California	155	45 = 36 + 9	29%
Penn State	**42**	**9 = 7 + 2**	**21 %**

* Georgia Institute of Technology has 159(45%) domestic part time MS.