

UNIVERSITY OF WYOMING

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RAISING THE STATURE OF GRADUATE RESEARCH EDUCATION AT UW

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Graduate education is a defining activity of the research university. At UW, graduate study advances our goal of exploring, creating, and sharing knowledge. Graduate students inject enthusiasm, imagination, and commitment, all of which energize the university's research enterprise. As teaching assistants they link the laboratory to the classroom and inspire and enhance undergraduate education. They catalyze the cascade of knowledge that makes the American research university the most sought-after college experience in the world.

For students, the benefits of their graduate education transcend their preparation with the knowledge and skills to become future intellectual leaders possessing the creativity and ability to solve the complex problems they will face in the workplace. Graduate education also produces well-educated citizens who promote ethical and democratic ideals and who contribute to the quality of life and cultural and social fabric.

On a national level, the discovery of new knowledge, technological breakthroughs, and innovations that emerge from the research university fuel economic and social prosperity. Federal support for basic research dates from Vannevar Bush's 1945 report, *Science, the Endless Frontier: A Report to the President*.¹ This report called for massive and sustained investments in the American research university, where scholars have the intellectual freedom, security, and academic environment in which to create new knowledge. Federal commitment to research and scholarship continues to the present with a recent directive from the executive branch for sustained federal support for research universities.²

The University of Wyoming welcomes the responsibility for introducing graduate students to a culture that advances their intellectual and ethical capacities to a level that is exemplary among public universities. We recognize that the best graduate programs have a clearly defined mission, explicit expectations, and consistently high quality. To achieve a higher stature for our graduate programs, UW must carefully define our specific goals and elucidate strategies for attaining them. This document outlines some of these goals and strategies, along with proposals for use of any future, additional financial resources to support them.

This document focuses on the PhD degree at UW, for two reasons. First, while all graduate degree programs are valuable in the preparation of future leaders, the PhD program plays a dominant role in defining the reputation and stature of the contemporary research university. Second, many other terminal degree programs — such as the DNP, EdD, JD, MBA, MPA, and PharmD — have specific professional

¹ Bush, Vannevar, 1945. *Science, the Endless Frontier: a Report to the President*. Washington D.C., United States Government Printing Office.

² Executive Office of the President, Memorandum for the Heads of Executive Departments and Agencies, from Peter R. Orzag, Director, Office of Management and Budget and John P. Holdren, Director, Office of Science Technology Policy, Science and Technology Priorities for the FY 2012 Budget, dated July 21, 2010. See also *Rising above the gathering storm: energizing and employing America for a brighter economic future*. Committee on Science, Engineering and Public Policy, 2007, National Academy of Sciences.

emphases that do not easily lend themselves to institution-wide discussion. However, it is important to note that the strategies we outline for improving our PhD programs apply equally to all graduate programs, and many of the investments we propose will benefit UW graduate students in any field.

A. CURRENT STATUS OF THE PHD PROGRAM AT UW

At the graduate level, the University of Wyoming awards a variety of master's degrees, PhD and EdD degrees, and JD and PharmD professional degrees. The total number of graduate degrees awarded has typically exceeded 600 per year, although a smaller number of JD and master's degrees were completed in 2009-2010 (see Table 1).

Degree program	2005-06	2006-07	2007-08	2008-09	2009-10
Master's degrees	439	422	432	423	388
PhD and EdD degrees	59	61	74	69	69
JD & PharmD degrees	116	118	117	131	110
Total graduate degrees	614	601	623	623	567

The University of Wyoming offers 33 Doctor of Philosophy degrees, almost all in STEM (Science, Technology, Engineering and Mathematics) disciplines (Table 2):

<u>College of Agriculture and Natural Resources</u> Agronomy Animal and Veterinary Science Entomology Molecular Biology Rangeland Ecology & Watershed Mgmt Soil Science	<u>College of Education</u> Counselor Education and Supervision Education
<u>College of Arts and Sciences</u> Anthropology Botany Chemistry Geology Geophysics Mathematics Physics Psychology Statistics Zoology	<u>College of Engineering and Applied Science</u> Atmospheric Science Chemical Engineering Civil Engineering Computer Science Electrical Engineering Mechanical Engineering Petroleum Engineering
<u>College of Business</u> Economics Management and Marketing	<u>Interdisciplinary PhD programs</u> Biomedical Sciences Ecology Hydrologic Science Molecular and Cellular Life Sciences Neuroscience Reproductive Biology

Table 3 summarizes the number of PhDs awarded at UW for the period 2005-2010. Over the past 5 years, the total number of PhD degrees awarded ranged from 54 in 2005-06 to 67 in 2005-06. PhD production is highest in the College of Arts and Sciences, which also offers the greatest number of PhD programs. Most programs award from 1-5 PhD degrees per year, although Chemistry, Geology, Psychology, Economics, Curriculum and Instruction, and Electrical Engineering have awarded more than 5 PhDs in some years. Some new PhD programs have yet to graduate students, including Management and Marketing, Biomedical Science, and Hydrologic Science.

Table 3. PhD degrees awarded, 2005-2010 (Source: UW Office of Institutional Analysis)

The University of Wyoming
PhD Degrees Awarded - By College, Department, and Program
Five-year History - Academic Year 2005-06 through 2009-10

COLLEGE/Department	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
COLLEGE OF AGRICULTURE					
Animal Science-Animal & Veterinary Sciences	3	2	1	1	1
Molecular Biology	2	4	1	3	0
Plant Sciences-Agronomy	2	2	1	2	0
Renewable Resources-Entomology	1	0	0	0	0
Renewable Resources- Rangeland Ecology & Watershed Mgt.	1	0	1	4	3
Renewable Resources-Soil Science	1	2	2	0	0
Veterinary Science-Animal & Veterinary Sciences	0	0	0	1	0
TOTAL AGRICULTURE	10	10	6	11	4
COLLEGE OF ARTS & SCIENCES					
Anthropology	0	1	1	0	3
Botany	2	1	1	0	0
Chemistry	4	5	10	2	1
Geology & Geophysics-Geology	1	6	1	3	2
Geology & Geophysics-Geophysics	4	1	3	0	1
Mathematics	2	1	0	2	2
Physics	0	0	0	2	3
Psychology	9	8	6	5	12
Statistics	0	0	0	1	2
Zoology & Physiology	6	2	5	4	3
TOTAL ARTS & SCIENCES	28	25	27	19	29
COLLEGE OF BUSINESS					
Economics & Finance-Economics	3	2	2	7	2
TOTAL BUSINESS	3	2	2	7	2
COLLEGE OF EDUCATION					
Adult Learning & Technology-Adult & Post-Secondary Education	0	4	1	3	2
Adult Learning & Technology-Instructional Technology	2	0	1	1	1
Counselor Education-Counselor Education & Supervision	5	2	3	1	0
Educational Leadership	0	0	1	0	0
Curriculum & Instruction	10	2	3	4	2
TOTAL EDUCATION	17	8	9	9	5
COLLEGE OF ENGINEERING AND APPLIED SCIENCE					
Atmospheric Science	1	2	0	1	1
Chemical & Petroleum Engineering-Chemical Engineering	1	1	0	3	1
Chemical & Petroleum Engineering-Petroleum Engineering	4	1	0	0	3
Civil & Architectural Engineering-Civil Engineering	0	2	2	0	1
Computer Science	0	0	3	1	1
Electrical & Computer Engineering-Electrical Engineering	2	4	8	3	3
Mechanical Engineering	1	1	4	2	1
TOTAL ENGINEERING	9	11	17	10	11
INTERDISCIPLINARY PROGRAMS					
Biomedical Science					
Ecology	0	0	0	1	3
Hydrologic Science	0	0	0	0	0
*Interdisciplinary studies	0	0	0	0	1
Molecular and Cellular Life Science	0	0	0	0	2
Neurosciences	0	1	3	2	0
Reproductive Biology	0	0	0	0	1
<i>*not a degree program, PhD awarded by petition</i>					
TOTAL INTERDISCIPLINARY PROGRAMS	0	1	3	3	7
TOTAL PhD DEGREES AWARDED	67	57	64	59	58

The administrative structure of graduate education at UW is new. In 2009 the Graduate School was discontinued and responsibility for graduate education was assumed by the Office of Academic Affairs. Responsibility for functions previously managed by the Graduate School, including graduate student recruitment and admissions, assistantship allocations, degree completion processes, and judicial functions, was redistributed to departments and programs, the Office of Admissions, Office of the Registrar, Office of Academic Affairs, and the Graduate Council.

B. ATTRIBUTES OF HIGH-QUALITY GRADUATE PROGRAMS

In October 2010, the Office of the President sponsored a series of group discussions with faculty and academic deans to consider the attributes of outstanding graduate programs and strategies for elevating the stature of graduate programs at UW. Although the focus was on the PhD degree, the participants included faculty whose departments offer only master's degrees or professional degrees, and most of the points raised apply equally to all degree programs. The participants identified five attributes that are shared by the best graduate degree programs at research universities:

- Clarity of mission and purpose,
- Outstanding faculty research and scholarship,
- Highly-qualified and motivated graduate students,
- Clear, consistent, and high expectations for graduate students, and
- Institutional commitment to graduate program excellence.

The importance of each of these five elements identified by the discussion groups has been recognized by others, as described briefly below.

Clarity of mission and purpose. In *Creation of the Future*, Frank Rhoades noted that although “doctoral education is one of the most distinctive and important activities of the contemporary research university”, in too many instances “there is a vagueness of purpose, wooliness of requirements, ambiguity of expectations, and laxity of supervision.” The participants agreed that UW should aspire to become one of the best programs, the kind that Rhoades described as “superb, unambiguous in their purpose, explicit in their expectations, consistent in their quality.”³ Participants in UW’s PhD programs must be ever mindful that they are preparing the nation’s leaders and the academy’s future. The best graduate programs have written mission statements that describe the expectations for depth and breadth of graduate student scholarship and address societal needs for intellectual leadership.

Outstanding faculty research and scholarship. Ultimately, the quality and reputation of PhD programs rest on the quality and reputation of its faculty members. These faculty scholars are leading their fields in new directions, their research addresses the most pressing intellectual issues of the day, and they are committed to scholarly excellence. But successful graduate programs require more of faculty than active scholarship. Expert mentoring and advising, which are among the most time-consuming forms of teaching, contribute greatly to graduates’ success and thus to the reputation of a program.⁴

Highly-qualified and motivated graduate students. These students contribute enormously to the success of graduate programs. To make best use of faculty time and institutional resources it is important to recruit capable and dedicated students, and to retain them through communication of explicit expectations, effective mentoring and advising, and a meaningful academic program and research experience. Both student quality and “fit” between a particular student and a specific program are important.⁵ Attrition from graduate programs is a national problem: the attrition rate from doctoral programs is estimated at 40%-50%, and even amongst recipients of the prestigious and highly

³ Frank Rhoades, 2001, *Creation of the Future*, Cornell University Press, Ithaca, p 122 and 126.

⁴ Council of Graduate Schools, 2010, *Ph.D. Completion Project: Policies and Practices to Promote Student Success*. www.cgsnet.org, p. 3.

⁵ Council of Graduate Schools, 2010, *Ph.D. Completion Project: Policies and Practices to Promote Student Success*. www.cgsnet.org, p. 2.

competitive NSF Graduate Research Fellowship Program 25% do not complete the PhD.⁶ Students who fail to complete degrees represent a significant lost investment of scholarly talent and of institutional resources; successfully addressing this problem leads to an immediate, improved return on both. One factor contributing to the attrition rate may be the length of time to degree; less than one quarter of students enrolled in doctoral programs complete their degrees within 5 years.⁷ Lengthy times to degrees also delay a young scholar's subsequent professional growth and most significant contributions to the discipline. UW should institute incentives that encourage students to finish degrees in a timely manner.

Clear, consistent, and high expectations for graduate students. UW departments and programs that award the PhD degree offer outstanding opportunities for students to pursue research at the frontiers of knowledge. But unless students have a clear understanding of expectations of the program and recognize the rewards of earning a degree, it can be difficult to recruit and retain them. Rhoades observes, "The Ph.D. is one of the most ambiguous activities of the university. Although it is acknowledged as the crowning product of the academy, there is precious little agreement on the function it serves."⁸ If students share this confusion, then they may find it difficult to weather the inevitable stress and challenges that are part of the process of independent scholarship. Career options for doctoral graduates are expanding beyond faculty appointments, with increasing numbers of PhDs taking jobs in business, government, and non-profit sectors. Students who develop skills that prepare them for an array of employment settings will be more competitive and likely to excel in their chosen careers.

Institutional commitment to graduate program excellence. Although much of the success and reputation of graduate programs derives from the aggregate accomplishments and contributions of faculty with a commitment to graduate student success, top-level institutional commitment to graduate education is important. Responsibility for graduate admissions, orientation and training in teaching and research practices, allocation and effective use of GAs and other resources, oversight of program and student performance, and approval of new programs or program modification is best assumed centrally. It is just as important that top-level administrators express the importance of graduate education to the success of the institution as a whole, reiterating to both internal and external constituents how graduate students enrich UW's academic community through their participation in the creation and dissemination of knowledge.

C. RECOMMENDATIONS FOR ELEVATING THE STATURE OF UW'S PHD PROGRAMS AND GRADUATE EDUCATION MORE GENERALLY:

Recognizing that some factors that strongly influence the reputation of graduate programs, such as an accomplished faculty, are built over decades and cannot be changed rapidly, we can identify strategies in five areas of graduate education that should help UW achieve increased stature on a shorter time-frame. These are that UW:

1. Establish explicit graduate program goals and expectations,
2. Improve student recruitment and admissions practices,
3. Institute more comprehensive student mentoring and advising and other measures to improve retention and timely degree completion,
4. Prepare students for successful careers, and
5. Assess effectiveness of graduate programs.

1. ESTABLISH EXPLICIT GOALS AND EXPECTATIONS

Every graduate program should have clearly articulated purposes and expectations that are published on their websites and in the general bulletin. These should include specific information about program

⁶ Wendler, C., Bridgeman, B., Cline, F., Millett, C., Rock, J., Bell, N., and McAllister, P. 2010. *The Path Forward: The Future of Graduate Education in the United States*. Princeton, NJ: Educational Testing Service, p. 27.

⁷ Data from the Council on Graduate Schools' Ph.D Completion Project, quoted in Wendler, C., Bridgeman, B., Cline, F., Millett, C., Rock, J., Bell, N., and McAllister, P. 2010. *The Path Forward: The Future of Graduate Education in the United States*. Princeton, NJ: Educational Testing Service, p. 31.

⁸ Frank Rhoades, 2001, *Creation of the Future*, Cornell University Press, Ithaca, p 124.

requirements, content, and a timeline for degree completion.

At UW, the PhD degree requires successful completion of 42 hours of course work and 30 hours of dissertation credit for a total of 72 hours (minimum) beyond the bachelors degree. Departments and programs should design a course of study that is possible to complete within 5 years from the baccalaureate. All PhD degree programs should share common elements that promote timely completion of significant scholarship. Guidance and resources for successful PhD programs are available from many sources, including an initiative undertaken by the University of Washington, explained at <http://www.grad.washington.edu/envision/>.

One model for PhD program guidelines that could be adopted at UW is as follows:

- By the end of the 2nd semester, each doctoral student must complete a qualifying “preliminary” exam as prescribed by individual departments and programs.
- By the end of the 4th semester, each doctoral student should submit a prospectus or proposal for the dissertation, including:
 - a statement of the topic of the dissertation and its importance,
 - a review of previous work, including a bibliography,
 - a proposed outline of the dissertation,
 - a plan for where and how the work will be carried out, and
 - a provisional timetable for completion.
- The dissertation should demonstrate mastery of the subject, make an original and significant contribution to the field, and reflect an ability to write well in the discipline. It may consist of the discovery of new information, a new synthesis, the development of new methods or theories, or the application of established methods to new materials. The value of the dissertation depends upon the quality of thought *and* clarity of exposition. There is an expectation for peer-reviewed publication from the dissertation research as evidence of original contribution to the field.
- Upon completion of the dissertation, students will make a public presentation of the main findings followed by an oral examination of the material by the student’s PhD committee.
- The PhD committee will consist of at least 5 members who hold the PhD degree. The committee must be composed of a minimum of four UW academic personnel, one of whom is from outside the major department. The committee will be named prior to the qualifying examination.

2. IMPROVE STUDENT RECRUITMENT AND ADMISSIONS PRACTICES

Graduate program excellence depends upon recruiting top applicants, selecting those who are good fits to our programs, and providing applicants with all the information needed to make informed decisions. UW should adopt higher minimum admissions standards and work to establish strong recruiting practices. By taking these steps UW will develop a graduate student population with academic ability, students who find the UW culture compatible with their own, and students who have made their decision to attend based on a full understanding of the UW’s expectations for them.

Successful strategies for recruiting may include:

- Be pro-active in recruiting graduate students. It is not enough to wait for applicants to come to us.
- Adopt some or all of the following recruiting strategies:
 - Develop up-to-date department websites that list graduate opportunities and describe faculty research.
 - Develop “pipelines” of graduate student referrals from colleagues and former students at other institutions.
 - Recruit at conferences. Visit student posters and tell student presenters about graduate programs at UW.
 - Follow up promptly with all student inquiries. Call, e-mail, let them know you value graduate students as part of the scholarly enterprise.
 - Bring students to campus to visit prior to admitting them so you can look each other over. Assign student hosts with good attitudes. Involve visiting students in both academic and social events.
 - Encourage innovative recruiting practices with resources.
- Make attractive offers of admission:
 - Admit students early—this lets them know you want them and you might get them before other universities make offers.
 - Offer adequate support along with offer of admission. Enhance the stipend for the best applicants, offer summer support or a small scholarship as an enticement, and make multi-year financial offers, contingent on good performance. For a PhD student, 4 years of financial support are reasonable. Describe in writing the job expectations that are associated with GA support.
 - Provide excellent procedural support for the admissions process. Good mechanics are essential to success of graduate programs. They should work so well that no one even notices them

3. INSTITUTE MORE COMPREHENSIVE STUDENT MENTORING AND ADVISING, AND OTHER MEASURES TO IMPROVE RETENTION AND TIMELY DEGREE COMPLETION

UW should review our existing efforts that support graduate student success and consider how these may be augmented. Orientation, professional development, mentoring, improving the academic and social environment, and supporting students in the final stages of their PhD all can lead to improved outcomes for our students. Many worthwhile recommendations are available from the Council of Graduate Schools' *PhD Completion Project*, some of which are included below.

Strategies for supporting graduate student success may include:

- Orientation and Professional Development
 - UW should continue to offer general orientation to graduate education at UW at the start of each academic year, and
 - Continue to offer the Graduate Student Teaching and Learning Symposium, required for every graduate student with a first-time instructional assignment at UW.
 - Students should receive teaching assignments with adequate time to prepare.
- Mentoring
 - Graduate students deserve clearly defined program expectations and academic milestones. Departments and programs should track student progress carefully. Students should develop electronic portfolios of their academic achievements and evaluations of their work. Students deserve quality advising, including *early* advising. Clear expectations should be set for time to degree, expectation of peer-reviewed publication, etc.
 - Faculty must be held accountable for the purposeful supervision of graduate students. They should be provided training and resources on graduate student mentoring so they have clear expectations of both their own and the student's responsibilities in developing a productive student-advisor relationship. Faculty should provide reviews of their graduate students' progress as part of their annual updates.
- Providing a positive academic environment for graduate students
 - UW should promote an academic environment within and among departments for academic and social interaction and celebrate graduate student achievement. Opportunities to participate in department events and regular social gatherings help to provide this environment.
 - UW should be mindful of graduate student family needs, such as childcare, family access to university recreational facilities, cultural programs, and so forth.
- Provide a supportive research environment
 - The social interaction characteristic of the sciences, with apprenticeships, research teams, and laboratory settings provides more support than solitary individual research that can be characteristic of the humanities. Extra efforts should be made for graduate students who work outside of the research group environment, including providing funding for these students to attend professional meetings early in their programs.
 - UW must involve new graduate students in research early in their program, and give all students opportunities to attend professional meetings.
- Support PhD students at the dissertation writing stage
 - Consider fellowships without job duties for the final semester of PhD programs.
 - Consider a dissertation writing residency or institute. Students and faculty have invested too much to risk losing PhD students in this final stage.

4. PREPARE STUDENTS FOR SUCCESSFUL CAREERS

In addition to providing support for research and teaching workshops, resume writing workshops, and opportunities to hone interview skills⁹, UW can take additional steps to prepare its graduates for careers both inside and beyond academia.

- All graduate students supported on state-funded assistantships should receive training in effective college teaching to support them in carrying out their teaching responsibilities and in building a record of professional accomplishment in college-level instruction.
- Graduate students should receive training in professional and research ethics, project management, and skills that enhance the impact of scholarly research, including communication,

⁹ Some current UW programs include trainings and seminars offered through the Office of Research and Economic Development, coursework including Grad 5910: Course in College Teaching, the Ellbogen Center for Teaching and Learning Graduate Student teaching and learning workshops and seminars, and programs offered by the Center for Advising and Career Services.

teamwork, how to relate one's research to a broader context, and application of research to larger corporate or social purposes, and

- Students should be offered opportunities to develop skills in entrepreneurship and innovation in conjunction with the core discipline.

Two existing programs could be models for accomplishing these goals. The first is a UK government-run program that prepares students to contribute their academic expertise to society as scholar-citizens (<http://www.vitae.ac.uk/>).

The second is an optional, add-on certificate course offered to PhD students that encourages knowledge and technology transfer and greater societal applications for the PhD student's research. The University of Southern California has such a program in its new "Diploma in Innovation." See <http://www.usc.edu/schools/GraduateSchool/iDiploma/>.

5. ASSESS EFFECTIVENESS OF GRADUATE PROGRAMS

Successful graduate programs will track outcomes and weigh these against their goals. Important information may include:

- Numbers of students recruited and retained,
- Clarity of expectations, suitability, accessibility, and effectiveness of curriculum,
- Time to degree,
- Employment of graduates both initially and as their careers progress,
- Publications that result from dissertation research and citation rates of those publications,
- Graduate student satisfaction with their programs, both while at UW and after graduation, and
- Board certification, licensure, or other metrics, as appropriate for the discipline.

Graduate programs should be expected to evolve over time, and it is important to review program goals periodically in light of changes in available financial support, faculty numbers and expertise, facilities, and degree and job demand.

A NOTE ABOUT INTERDISCIPLINARY PROGRAMS

Interdisciplinary programs face special challenges. A recognition that complex societal problems require cooperation of experts from a variety of disciplines has led to the development of interdisciplinary graduate degree programs both at UW and across the nation. These interdisciplinary programs cut across departments and colleges and typically do not enjoy the same level and permanence of financial and staff support. Moreover, departments may view these programs as competitors for resources. For these reasons, successful interdisciplinary programs must be capable of adding value, visibility, and resources to departments. The success of interdisciplinary programs rests on the quality and commitment of departments they link, and on the ability of programs to foster links between departments. These challenges require a strong, very dedicated program director for each interdisciplinary program who champions the program and motivates participation by faculty and students. We encourage interdisciplinary programs to develop mechanisms for:

- Recognizing and valuing faculty participation,
- Ensuring that faculty who have committed to participate in interdisciplinary programs devote the required amount of time,
- Access to administrative staff support for program directors, and
- Preparing for the succession of interdisciplinary program directors.

A NOTE ABOUT ESTABLISHING, MODIFYING, AND DISCONTINUING GRADUATE PROGRAMS

For UW's graduate programs to remain vibrant and relevant over time there must be a mechanism for developing new programs, and modifying or discontinuing existing programs. The following principles should apply to such decisions:

- UW should build on our strengths.
 - We are too small to do everything well, but UW can excel in areas of distinction.

- We should focus on programs that take advantage of our geography and natural resources, culture and history.
- We can be more flexible and innovative than larger institutions.
- Our natural environment is an asset.
- Larger, more broadly defined PhD programs are better positioned to adapt to changes in research frontiers and faculty strengths than are smaller, highly specialized programs. For example, PhD program in mathematics has a better chance of establishing and maintaining a stable reputation for excellence than a PhD program in partial differential equations.
- We should not offer a graduate program unless it can be done well and it is worth doing.
 - We can't expect uniform participation, so we will be most successful when we develop good programs from the bottom up and encourage only units that want to participate. Other programs may not have the interest or ability to grow beyond existing obligations to academic programs.
 - Some areas of graduate-level research require infrastructure that UW would find difficult to provide. For example, it could be argued that we lack an adequate human subjects population for some areas of biomedical research that typically require access to a medical school. We shouldn't try to do the impossible.
 - We must be mindful that we don't slice available resources too thinly by providing more graduate programs than we can afford to do well.

D. PRIORITIES FOR ADDITIONAL FUNDING

Based on the discussion above, we can identify a number of areas where the investment of additional resources could produce a measureable benefit for the quality of UW's graduate programs. For illustrative purposes, we suggest how an investment might be distributed on the table below.

Some of the measures listed on the table should be instituted within each graduate degree program immediately, and be prerequisite to receiving additional financial resources. For example, defining explicit program goals and systematic tracking of program outcomes should be in place before programs are eligible to apply for additional GAs or support for students, faculty or staff.

Other measures, such as instituting an electronic application system, require large one-time initial costs, but in future years less money will be needed for these purposes and more funding can be allocated to student support.

Working to raise the stature and quality of graduate research education at UW is an on-going process. Allocations should be reviewed annually and budgets adjusted to maximize effective use of the funds.

Measure	Investment
<p><i>1. Establish explicit goals and expectations</i></p> <ul style="list-style-type: none"> • Institute higher graduate program entrance requirements university-wide, especially for the PhD 	No cost
<p><i>2. Improve student recruitment and admissions practices</i></p> <ul style="list-style-type: none"> • Improve recruitment practices. Provide funds (~\$500/student) to departments that develop strong proposals with realistic goals • Institute GA job expectations and time limitations for state GA funding • Increase number of GAs for PhD students, especially in disciplines that are not supported by additional GA resources (SER, INBRE) (~\$25,000/yr per student). • Offer higher GA stipends for especially well-qualified PhD applicants (~\$30,000/yr per student) • Improve application process with electronic application system 	70%
<p><i>3. Institute more comprehensive student mentoring and advising and measures to improve retention</i></p> <ul style="list-style-type: none"> • Summer support for PhD students • Support for PhD students at the dissertation stage • Professional development programs, including ethics of research, etc. • Provide funds for student off-campus collaborative research experiences 	18%
<p><i>4. Prepare students for successful careers</i></p> <ul style="list-style-type: none"> • Professional development programs (like Vitae in UK, http://www.vitae.ac.uk/) • Certificate program to encourage innovation (like USC diploma program) 	10%
<p><i>5. Assess and improve graduate programs, institute new programs</i></p> <ul style="list-style-type: none"> • Institute uniform tracking of outcomes by program • Funding for external graduate program reviews • Awards for outstanding graduate program staff and faculty 	2%

E. CONCLUSION

PhD degree programs distinguish research universities from other colleges and universities. The purpose of doctoral education is to develop students as “stewards of the discipline.” As described by the Carnegie Foundation for the Advancement of Teaching, “a steward is a scholar in the fullest sense of the term—someone who can imaginatively generate new knowledge, critically conserve valuable and useful ideas, and responsibly transform those understandings through writing, teaching, and application. Stewardship also has an ethical and moral dimension; it is a role that transcends a collection of accomplishments and skills. A steward is someone to whom the vigor, quality, and integrity of the field can be entrusted.” UW graduate programs play an essential role in the creative growth of knowledge within disciplines and the development of new fields of intellectual endeavor, and the benefits accrue not only to our institution but to society at large.