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FOR
VOLUME 2
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3. U. T. System: Annual report on research and technology transfer

Research and Technology Transfer

Annual Report

H. Keith McDowell, Ph.D.
Vice Chancellor

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2007

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Overview

- Research
  - National Rankings
  - Research Expenditures
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- Technology Transfer
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RESEARCH

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Change in National Rankings, Total Science & Engineering Research Expenditures 2001-2005

	Public Institutions		Public & Private Institutions	
Institution	**Change 01-05**	2005 Rank	**Change 01-05**	2005 Rank
U. T. Arlington	**3**	144	**6**	203
U. T. Austin	**1**	20	**1**	32
U. T. Dallas	**31**	122	**45**	171
U. T. El Paso	**(11)**	149	**(15)**	209
U. T. Pan American	**5**	243	**17**	342
U. T. San Antonio	**9**	157	**18**	220
U. T. Southwestern Medical Center – Dallas	**6**	28	**3**	46
U. T. Medical Branch – Galveston	**9**	63	**8**	93
U. T. Health Science Center – Houston	**(9)**	68	**(12)**	98
U. T. Health Science Center - San Antonio	**(5)**	70	**(9)**	101
U. T. M. D. Anderson Cancer Center	**15**	21	**18**	34

Note. Parentheses indicate a decline in rankings. Source: WebCASPAR database, National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges, accessed March 2007.

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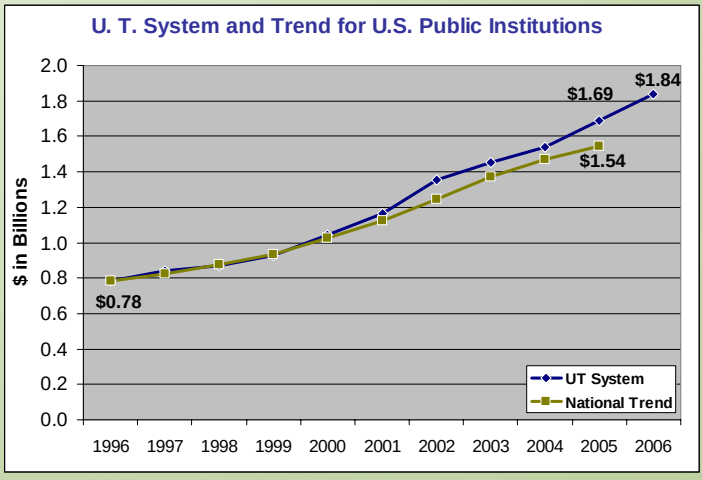
Total Research Expenditures Over Time



Note. The national trend is computed using equal starting points in 1996 and adding the average percentage increase in research expenditures for all U.S. public universities and colleges each year (NSF). The U. T. System line reflects actual data (THECB).

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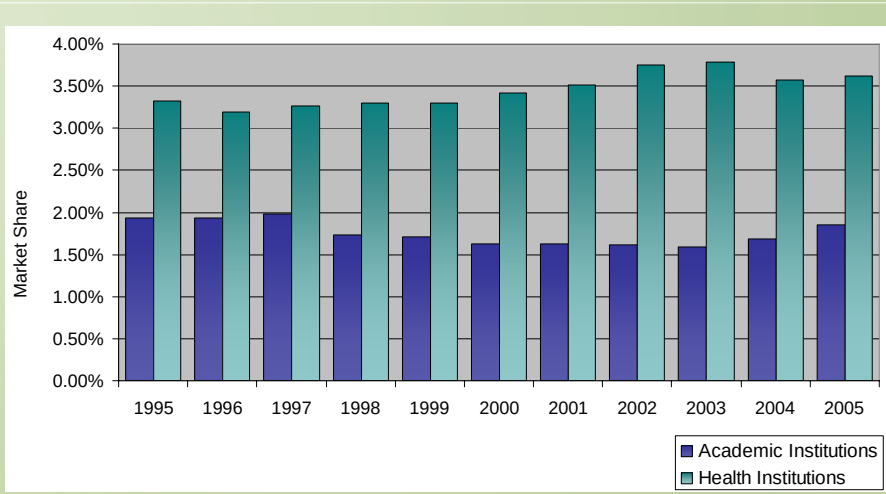
U. T. System Market Share of Total U.S. Public Institution Research Expenditures



Source: WebCASPAR database, National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges, accessed March 2007.

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Research Capacity: Distinguished Faculty Awards

U. T. System has 41
National Academy of Sciences members

Institution	Cumulative NAS Members	Average Number NAS Members of Peers
U. T. Austin	20	33
U. T. Dallas	2	1
UTSWMC	17	29
UTHSCH	2	15

Source: U. T. System Accountability and Performance Report, 2007; peer comparisons: awards membership directories, accessed 4/07.

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Research Capacity: Distinguished Faculty Awards

U. T. System has 51
National Academy of Engineering members

Institution	Cumulative NAE Members	Average Number NAE Members of Peers
U. T. Austin	50	20
U. T. Dallas	1	5

Source: U. T. System Accountability and Performance Report, 2007; peer comparisons: awards membership directories, accessed 4/07.

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Research Capacity: Distinguished Faculty Awards

U. T. System has 29
Institute of Medicine members

Institution	Cumulative IOM Members	Average Number IOM Members of Peers
UTSWMC	17	31
UTMB	4	14
UTHSCH	5	17
UTHSCSA	2	7
UTMDA	1	14

Source: U. T. System Accountability and Performance Report, 2007; peer comparisons: awards membership directories, accessed 4/07.

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TECHNOLOGY TRANSFER

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Texas Emerging Technology Fund

A $200M fund created to expedite the development and commercialization of new technologies and to recruit the best research talent in the world

Program	Total ETF Awards in Texas	Awards Received by U. T. System Institutions	% Funds Awarded to U. T. System Institutions
Research Superiority	$35M	$20M	56%
Commercialization	$29M	$26M	90%
Research Matching	$17M	$12M	70%
Total	**$81M**	**$58M**	**71%**

Source: Texas Governor's Office, 8/31/07; only includes awards with signed contracts

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Emerging Technology Fund Awards to the U. T. System

Awards for the Acquisition of Research Superiority

Institution	Research Area	Amount Awarded
U. T. Medical Branch - Galveston, U. T. Health Science Center - Houston, U. T. M. D. Anderson Cancer Center	**NanoHealth** Mauro Ferrari	$ 2.5M
U. T. Tyler	**Indoor air quality** Jan Sundell	$ 3.75M
U. T. San Antonio	**Information security** Ravi Sandhu	$ 3.5M
U. T. Arlington, U. T. Austin, U. T. Dallas	**Nanoelectronics** e.g., Yves Chabal (1 of 8)	$10M

Source: U. T. System Institutions; only includes awards with signed contracts

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3. U. T. System: Annual report on research and technology transfer (cont.)

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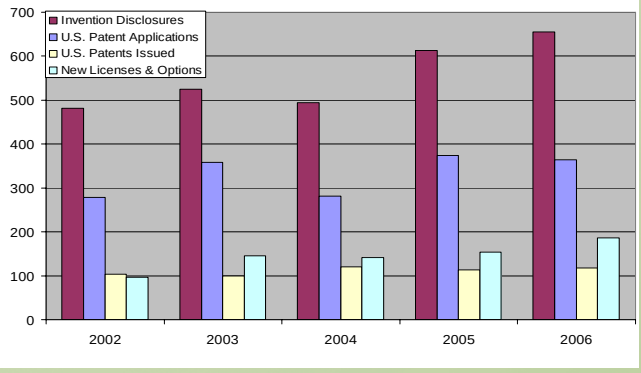
Technology Transfer Activities Over Time



Multiyear Totals 2002 - 2006	
Invention Disclosures	2,768
U.S. Patents Issued	553
Licenses	724
Gross IP Revenue	$151M
Start-up Companies	66

Source: Texas Higher Education Coordinating Board Technology Development and Transfer Survey

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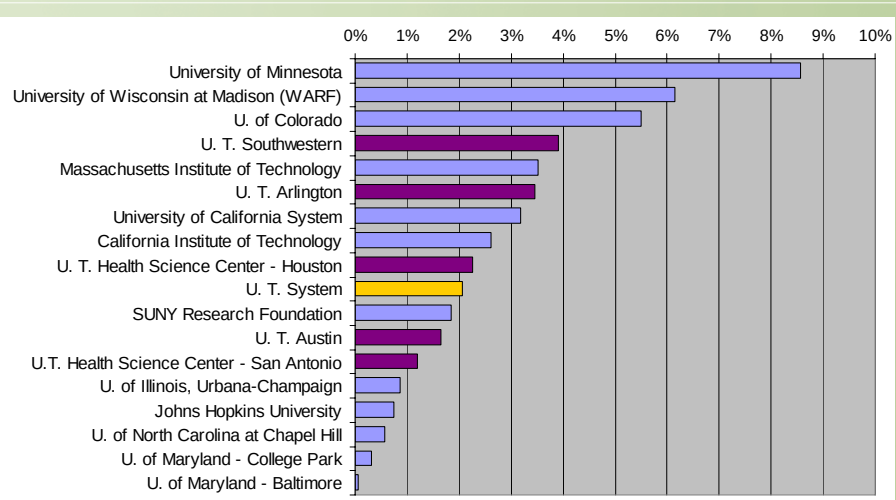
Gross Intellectual Property Revenue as a Percentage of Research Expenditures



Source: Association of University Technology Managers Licensing Survey: FY 2005.

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Change in Technology Transfer

- Technology transfer activities continue to increase; over the past 5 fiscal years:
  - **36%** increase in invention disclosures
  - **14%** increase in U. S. patents issued
  - **92%** increase in licenses and options executed
  - **34%** increase in gross revenue from intellectual property

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U. T. System Rankings: Technology Transfer

- 1st in the world in number of **biotech** patents (Milken Institute, 2006)
- 2nd as a **"patent powerhouse"** reflecting quality and quantity of U.S. patents (*The Scientist*, 2005)
- 4th in the nation in **U. S. patents issued** (USPTO, 2006)
- Five institutions rank in the top 100 on the **Milken Institute Technology Transfer and Commercialization Index**
  - U. T. Austin
  - U. T. Southwestern Medical Center – Dallas
  - U. T. Medical Branch – Galveston
  - U. T. Health Science Center – Houston
  - U. T. Health Science Center – San Antonio

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Office of Research & Technology Transfer Initiatives

Promoting a culture of innovation and entrepreneurship

- Key Collaborative Research Initiatives
  - Research Collaborations Initiative
  - Texas Alliance for Nanotechnology (TxAN)
  - Texas Nanoelectronics Research Initiative
  - Sandia research peer review and research collaborations
  - Texas Advanced Computing Center (TACC)
- Key initiatives in technology transfer
  - Regional Technology Transfer Initiative
  - Technology transfer data management system and data standards
  - Research and Technology Transfer Showcase
  - Chancellor's Entrepreneurship & Innovation Awards

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OFFICE OF RESEARCH AND TECHNOLOGY TRANSFER

Promoting a culture of innovation and entrepreneurship

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9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report

The University of Texas System Report from the Task Force on Doctoral Education and the Postdoctoral Experience

June 2007

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Executive Summary

The University of Texas System Board of Regents has invested heavily to make the UT System more competitive and to increase student success. To fully realize the benefits of that initial investment, the System and the state of Texas must strategically invest in doctoral and postdoctoral education essential to achieving these goals.

Doctoral and Postdoctoral Education is an investment in human capital that will pay important dividends in the future by providing:

- Educated and principled leaders for business, government, and universities.
- Discovery, innovation, and understanding – which is the basis of competitiveness.
- Leadership in research, technology, and intellectual property.
- A highly educated populace with critical-thinking and problem-solving skills essential for creativity and innovation.

If this investment in human capital is made, the Task Force on Doctoral Education and the Postdoctoral Experience believes that not only will the UT System become an even more important educational leader in today's global knowledge-based economy but will also more closely reflect the changing demographics of the state as the System realizes its goal of increasing the number and diversity of outstanding, high-quality graduates of its doctoral and postdoctoral programs.

Charge to the Task Force

In 2006, The UT System unveiled an ambitious strategic plan for the coming decade that was designed to help ensure that the System, Texas, and the nation would be competitive in the 21st century. The plan called for a Task Force on Doctoral Education and the Postdoctoral Experience to be convened to consider how to:

- recruit, retain, and graduate more doctoral students and postdoctoral scholars;
- enhance the value and contributions of these programs to their institutions, the UT System, and the state; and
- increase the competitiveness and prestige of the UT System's research, education, and service programs.

To this end, a task force with representatives from all UT System institutions that offer Ph.D. programs was appointed in June 2006, and obtained widespread input from all System institutions. Meetings were held in Austin, Dallas, El Paso, Houston, and San Antonio to obtain first-hand input from administrative leaders, faculty, doctoral students, and postdoctoral scholars from campuses which have Ph.D. programs. Representatives from UT Brownsville, UT Pan American, UT Permian Basin, and UT Tyler also met with the group, as did Dr. Raymund Paredes, Commissioner of the Texas Higher Education Coordinating Board.

Before finalizing this report, the task force distributed drafts for review by the institutional presidents, other campus and System leaders, and the Faculty Advisory Council. A preliminary report was made to the Board of Regents.

Summary of Key Recommendations

<u>The UT System must</u>:

- Prominently address doctoral and postdoctoral education in major UT System planning efforts.
- Hold institutional leaders accountable for establishing and maintaining competitive doctoral and postdoctoral programs in line with System plans and institutional missions
- Provide health benefits equivalent to those received by faculty and staff for all full-time, salaried doctoral students and postdoctoral scholars.
- Increase the recruitment and success of outstanding, diverse doctoral students and postdoctoral scholars.
- Conduct rigorous reviews of new proposals and ongoing programs that involve external peers.
- Facilitate and support the development of trans-disciplinary research educational programs.

UT System institutions must:

- Explicitly include doctoral and postdoctoral education in planning, budget preparation, evaluation, and external communications.
- Disseminate expectations, commitments, and anticipated timelines for their doctoral and postdoctoral programs.
- Conduct rigorous peer reviews with external reviewers of new proposals and ongoing programs.
- Include expectations and rewards for doctoral and postdoctoral education in tenure and promotion guidelines and support development of required skills.
- Facilitate and support the development of trans-disciplinary research and educational programs.
- Teach critical-thinking and problem-solving skills that prepare graduates for a wide range of careers.
- Incorporate doctoral students and postdoctoral scholars more fully into the community of scholars on university campuses.

In addition to recommendations, this report includes several key appendices to assist the UT System and institutions, guide the implementation of recommendations, and aid programmatic reviews. The material in these appendices, especially the sections on *Best Practices and Characteristics of Competitive Programs* and *Impediments and Critical Areas for Improvement*, were critical in determining the Task Force's recommendations.

Key Outcomes of Implementing Task Force Recommendations

- Increase the competitiveness of the UT System by ensuring institutions adopt best practices
- Increase the number of outstanding, diverse doctoral and postdoctoral students at UT System institutions by a combination of
  - summer undergraduate research programs,
  - Regents' fellowships for doctoral students,
  - incentives for recruiting the most talented, capable postdoctoral scholars, and
  - institutional grants to create innovative, trans-disciplinary programs for doctoral and postdoctoral students.
- Increase the recruitment of full-time doctoral and postdoctoral students in an intensely competitive market and ensure their success by providing health benefits comparable to those received by faculty and staff.

Enhancing Doctoral Education and the Postdoctoral Experience - An Ongoing Process of Providing Human Capital

For these initial recommendations to have a lasting effect, doctoral and postdoctoral education must become an integral and ongoing component of System and institutional strategic plans and must be linked to budget planning to provide adequate, stable support. The Task Force recommendations are but the beginning of what must be a continuing process to achieve the UT System's strategic goals.

Faculty members are the leaders in education, research, and discovery. If the Task Force recommendations are to have the intended effects, faculty must be involved in the planning, implementation, and ongoing review of doctoral and postdoctoral education. Faculty must also be assured of the intellectual freedom, flexibility, and academic environment to foster the innovation and creativity essential for maximal effectiveness and competitiveness.

Involving faculty along with the administrative leaders at the institutional and System level in the implementation of the recommendations will enable the UT System to achieve its strategic goals of increasing student enrollment and success, attracting outstanding faculty, becoming highly competitive for research support and productivity, and improving the economy and health of Texas, as well as providing the human capital necessary for leadership and advancement.

I. Background and Charge

In 2006, The University of Texas System Board of Regents unveiled an ambitious strategic plan for the coming decade that was designed to help ensure that the UT System, Texas, and the nation would be competitive in the 21st century. Strong doctoral and postdoctoral programs are necessary for achieving the System's strategic goals; providing the highly trained scientists, engineers, humanists, and leaders for our universities, government, foundations, and the private sector; and achieving and maintaining a high degree of competitiveness in today's knowledge-based economy. The Board of Regents thus convened the Task Force on Doctoral Education and the Postdoctoral Experience in June 2006, with the following charge:

> The charge to the Task Force is to consider doctoral and postdoctoral programs within the UT System and make recommendations to the Chancellor and Board of Regents to:
>
> 1) Identify the most critical areas for improvement in the quality of doctoral and postdoctoral programs within the UT System and recommend appropriate actions.
> 2) Recruit, retain, and graduate more doctoral students and postdoctoral scholars in support of *The UT System Strategic Plan 2006-2015* and the state's *Closing the Gaps* initiative.
> 3) Increase at the K-16 levels awareness of and interest in graduate and postdoctoral programs in all fields and make careers more attractive in areas where critical shortages are currently recognized (e.g., science, math, and engineering) and others that might be identified as high priority in the future by UT System and individual institutions' strategic plans.
> 4) Enhance the value and contributions of doctoral and postdoctoral programs to their institutions, the UT System, and the state.
> 5) Increase the competitiveness and prestige of the UT System's research, education, and service programs.

Prior to developing recommendations the Task Force felt it was essential to seek widespread input from faculty, students, and administrative leaders at all UT System institutions. Meetings were held in Austin**,** Dallas, El Paso, Houston, and San Antonio with members of these groups from all UT System institutions which have Ph.D. programs. Representatives from UT Brownsville, UT Pan American, UT Permian Basin, and UT Tyler also met with the Task Force. In addition, Dr. Raymund Paredes, Commissioner of the Texas Higher Education Coordinating Board, spoke to the Task Force about his views on graduate education.

Although increasing the enrollment, diversity, and success of doctoral and postdoctoral students raises the important question of regional and institutional program locations, the Task Force did not address this issue since it was outside the charge. Furthermore, the Task Force felt the UT System institutions are more qualified to propose programs for their individual campuses. The Task Force emphasizes that these issues should be a major element of both the System and institutional strategic plans which are part of the Task Force recommendations. All institutions may aspire to doctoral and postdoctoral programs within their approved missions, but all programs, without exception, must adhere to best practices and undergo rigorous, meaningful review to ensure that they possess the characteristics of competitive programs the Task Force has provided in Appendix 1.

II. Introduction

There is a need to enhance public understanding of doctoral and postdoctoral education and what these programs contribute to the individual, to the global economy, and to society at large. There are a number of measures to benchmark System performance against, and many of these are already being collected.[1, 2] To develop and maintain the programs that are needed for the System, state, and nation to be highly competitive, the System must examine what it is doing, what its most competitive peers are doing, and what is needed to close that gap.

As part of its discussions, the Task Force considered several different models of doctoral and postdoctoral education. For example, the English system of graduate education utilizes a fixed-time end point rather than a required product end point. Another model is the Cold Spring Harbor Graduate School, a small, highly specialized program that focuses exclusively on the biomedical sciences and graduates Ph.D.s in far less time (four years) than most other institutions.

The model currently in place in UT System and most peer institutions is clearly not the only effective one. However, the Task Force unanimously agreed that it is the only one that is feasible for the foreseeable future for the UT System and other institutions of comparable size, scope, complexity, mission, and mechanisms of support.

There are several key elements that are essential to highly competitive doctoral and postdoctoral programs that should be noted at the outset:

- Programs must have a critical mass of faculty actively engaged in research with a stable base of funding, adequate infrastructure, and an administration that understands and supports research and research training.
- Competitive programs are expensive to establish and maintain; increasing the competitiveness of existing programs will require additional funding.
- New programs should only be initiated if they are in line with UT System and institution strategic plans and if adequate and sustainable funding for them is identified.
- As emphasized in the state's *Closing the Gaps* report, doctoral and postdoctoral programs cannot meet the state's workforce needs without significantly increasing diversity to more closely reflect the state's growing and changing population.

Before generating the recommendations in the report, the Task Force felt it was important to learn from discussions with UT System faculty, administrators, and students about what they considered the best practices and the impediments to competitive programs (these are provided in Appendices 1 and 2, respectively). To address these concerns and help the UT System to develop the strong doctoral and postdoctoral programs that are called for in its strategic plan, the Task Force formulated a series of broad recommendations at both the System and institution level. The recommendations focus on over-arching issues that apply to most programs at all UT System institutions.

The Task Force also defines the key features of competitive programs and presents guidelines and best practices that will ensure that our doctoral and postdoctoral programs possess these requisite features. The recommendations together with the guidelines may also provide a useful framework for evaluating current programs and proposals for new programs or substantive changes in existing ones. The Task Force strongly recommends that programs that do not meet these standards be eliminated outright or seriously scrutinized for subsequent elimination if deficiencies are not remedied during a defined probationary period.

Along with the characteristics of competitive programs, the Task Force has appended a synopsis of some of the major impediments to competitive doctoral and postdoctoral programs as identified in discussion with administrators, faculty, doctoral students, and postdoctoral scholars. Not all impediments are present at every UT System institution, but, when present, they do have a serious negative impact. This information should serve as another aid for System, presidents, and other leaders to determine whether these impediments may exist and take corrective actions if necessary.

A university's overall competitiveness and reputation for scholarship and research are determined to a very substantial degree by the quality and scope of its doctoral and postdoctoral programs. For example, key

factors of institutional reputation and competitiveness include the number of doctoral and postdoctoral training grants, individual fellowship awards, and amount of extramurally-sponsored research which is performed largely by doctoral students and postdoctoral scholars. The National Research Council's Survey of Graduate Programs is a national, peer-based review of doctoral programs that is one of the most widely used indicators of the overall quality and competitiveness of a university within the academic community.

With the proper encouragement, planning, and support, doctoral and postdoctoral programs can flourish within the System and increase its stature, effectiveness, and prestige in all areas. This is inherently worthwhile but is also a critically important element to attract faculty members who can best obtain external grant support, make breakthrough research discoveries, provide the best leadership and service, and further enhance the competitiveness and prestige of the UT System. Such faculty members in turn further enhance the System's competitiveness for recruiting doctoral and postdoctoral students. This interplay creates a continuously upward momentum the world's greatest universities enjoy.

> *"When Southwestern loses a brilliant faculty recruit to one of our prestigious competitors, it is not money, not research space or environment, and not quality of our faculty that is lacking. It is most often a fear in young faculty that they will not be able to recruit high quality graduate students in the same way that they can in Boston and San Francisco."*
>
> Alfred Gilman, M.D., Ph.D.
> Provost, UT Southwestern, and Nobel Laureate

III. The Nature of the Ph.D. Degree and Postdoctoral Education

The Ph.D. is a Research-Based Degree

The doctoral degree represents the highest level of knowledge and achievement in a particular field of study. There are three types of doctoral degrees: (1) "professional" doctorates such as medicine (MD) or law (JD); (2) "applied" doctorates such as education (EdD), public health (DPH), and nursing practice (DNP); and (3) the Doctor of Philosophy (Ph.D.) degree that is awarded for advanced studies in many different disciplines.

The purpose of the professional doctorate is to train skillful practitioners of a discipline; the degree does not usually require extensive original research. Applied doctorates conduct research in a very specific setting that may be aimed at solving a problem encountered primarily in that context (e.g., a particular school district or geographic area). The purpose of the Ph.D., which is the focus of this report, is to prepare scholars to conduct research and/or use research-related skills in academic, government, business, or other settings. The emphasis of the Ph.D. is to prepare scholars with the training and expertise to make independent intellectual contributions to their field. As such, it requires that every student conduct independent research culminating in a dissertation that is presented to the faculty and must be defended in public.

The Doctoral Education Program

Students who are about to complete their bachelor's degree, or have previously done so, may apply for admission to graduate school. Many apply for enrollment immediately after completing college, but others may enter the workforce, go on active military duty, or engage in other activities before seeking admission. Generally, most applicants to graduate school are in their early-to-late 20s but can be of any age.

Unlike undergraduate admissions in which a student applies to the university and only later selects a major area of study, graduate school applications are made to a specific department or program from which students select a more specific area within a year or two after matriculation. Students often apply to a specific university because they wish to conduct their doctoral research under the supervision of particular faculty members who are recognized research leaders in the applicant's field of interest. The pool of very top students is relatively small, and the competition to identify and recruit the best students is fierce at both the state and national levels.

During their first several years in a doctoral program, "pre-candidacy" students attend lecture courses to gain an overview of their field, its historical underpinnings, key concepts, and major gaps in knowledge. They also take courses that teach research skills and experimental methods; attend seminars about current research in their field; learn how to make written and oral presentations of research findings; study ethical issues pertinent to research and their discipline; and begin receiving hands-on research training.

After obtaining a solid grounding in the field and an introduction to research, students take the candidacy exam, a written and oral examination designed to test the student's breadth of knowledge in his or her discipline and to assess the student's readiness to conduct independent research. After passing the exam, the post-candidacy student is qualified to begin an original research study, or doctoral dissertation. Successful completion of advanced coursework, the initial research training, and the candidacy exam are important milestones that are monitored within the program to help ensure that the student is making timely and appropriate progress toward the Ph.D.

From this point onward the student spends most of his or her time performing the dissertation research under the guidance of a faculty advisor who is an expert in that area and has agreed to oversee the student's work. An advisory committee, typically made up of four or five additional faculty members, also helps assess progress and guide the student's work. When the advisor and committee believe the student has completed a meritorious research study, the student must publicly defend his or her research. If the advisor and advisory committee determine the research makes an important original contribution to the discipline, the student is permitted to write the dissertation and submit it for final approval.

The results of the dissertation research are typically presented at professional meetings and then published as research articles or in books. The publication of the doctoral student's original research increases the reputation and competitiveness of the student, the advisor, and the institution. The research performed by

doctoral students helps attract yet more research funding and professional recognition and awards and increases the institution's ability to recruit even more of the best faculty members.

Pre-candidacy education typically takes several years, and the dissertation research may then require two to six additional years depending upon the field, the difficulty of the research problem, etc. Consequently, individuals are typically in their late 20s or early 30s when they receive the degree, are frequently married, and may have children. Concerns such as housing, child-care, health benefits, life insurance, etc., are often critical for doctoral students, especially those whose spouses may also be graduate students and for couples that may have children.

Since the dissertation is original, creative research, students and faculty advisors accept a degree of uncertainty about the time it will take to complete. Although difficult to predict in advance, in most cases, the overall time to complete a Ph.D. varies from four to eight years. The success rate and time-to-degree of doctoral students within the UT System is comparable to that at other leading universities.

While enrolled in a doctoral program, most students receive financial support by means of fellowships, teaching assistantships, or research assistantships funded by their mentors' research grants. Often, students are not permitted to work outside the university. The amount varies considerably based on program and institution. Graduate students with teaching assistantships play an essential role in undergraduate education, often teaching classes and laboratories. Students with research assistantships and fellowships do the research studies for faculty grants. Universities could not operate effective research or undergraduate teaching programs without the contributions of doctoral students.

Postdoctoral Education

New Ph.D.s may enter the workforce or seek additional, specialized research training in postdoctoral positions that are typically designed to last from two to five additional years but do not culminate in a formal degree. These are temporary appointments that enable the scholars to focus almost entirely on their research and serve as a transition period to independent, permanent career positions. Because of the length of time it takes to complete doctoral and postdoctoral education, many people do not obtain their first permanent position until they are in their mid- to late-30s, or even their early 40s.

Postdoctoral education is more highly focused on a very specific research project and provides a much greater degree of independence than Ph.D. education. Postdoctoral education is common — and in some disciplines expected — for those whose long-range goal is to obtain a faculty position at a research intensive university or a research leadership position in a private company or government agency. The use of postdoctoral appointments varies not just by discipline — common in the sciences, less so in the humanities — but by institution; not all institutions use the same titles, formats, and structure.

Postdoctoral scholars (or fellows, trainees, or simply "post-docs") often come from other institutions, and are thus a rich source of new ideas and expertise for a university. They may also serve as teachers, mentors, and role models for doctoral students and undergraduates. Their salaries are less than those of faculty members, and their presence greatly enhances the intellectual environment of an institution in a cost-effective manner.

Postdoctoral stipends are generally in the range of $30,000 to $50,000 per year, which is modest given the candidates' extensive education and the important contributions that they make to the research programs of their universities. They may be supported from their mentor's research grants, or they may obtain their own fellowships from a government agency or private foundation to provide their salary support.

Postdoctoral scholars work on the projects funded by their mentor's research grants, so their efforts are essential to the success, productivity, and continued funding of faculty projects. Because postdoctoral scholars already have advanced research experience obtained during their Ph.D. education, they typically make some of the most important contributions to their mentor's research. As with graduate students, the research performed by postdoctoral fellows is presented at professional meetings and published in research articles and books, bringing recognition to the postdoctoral scholar, mentor, and institution.

A postdoctoral scholar's mentor, rather than the academic department or university, has typically assumed primary responsibility for education and salary support.[3] Nevertheless, universities as a whole are

increasingly recognizing the great value that these scholars have for research programs, and institutional best practices require that universities accept responsibility for providing postdoctoral scholars with career development opportunities and for establishing minimum standards for salaries and benefits.[4] This is increasingly important because the competition to attract the most talented, capable individuals is fierce and these benefits are highly attractive to prospective scholars. Along with graduate students, postdoctoral fellows are absolutely essential for the most competitive research programs and are a direct measure of the size and growth of its advanced research programs[1].

IV. The Value of Graduate Education: Investing in Texas and the Nation

Education, especially doctoral and postdoctoral education, is an investment in human capital. In today's global environment, knowledge powers the economy. Without serious, strategic investment in graduate education, the economy of Texas will soon be outpaced by the economies of other states and emerging countries, impacting the lives of all Texans. Investing in graduate education is, therefore, essential to the future of Texas and the nation.[5, 6]

The combination of high-quality faculty and talented graduate students and postdoctoral fellows drives graduate education and research in the UT System. Faculty provide the knowledge, mentorship, and guidance that doctoral students and postdoctoral scholars need to discover new knowledge; to integrate and apply that knowledge to new fields of study; and to pass on that knowledge to the next generation of students, scholars, scientists, and the public. Graduate students and postdoctoral scholars are the infrastructure that enables successful research at universities and health institutions. Without a critical mass of quality doctoral students and, where appropriate (largely in the sciences), postdoctoral scholars, high-quality, productive research is impossible, regardless of the facilities available.

The concept of graduate education as a process of storing and passing on knowledge is outdated. The value of graduate and postdoctoral education lies in the direct impact that the students, postdoctoral scholars, and faculty have on society and within the university. Graduate programs are the engines of change and of scientific, economic, and societal advancement. Doctoral education must adapt to the needs of humans, the environment, and technology, just as research funding is adapting to those needs. Furthermore, this education must also be pro-active — the desire in Texas must not be just to keep up but rather to lead.

The UT System should be a leader in redefining graduate education in terms of value. Faculty, programs, universities, health institutions, and the System itself should be judged in accordance to the value added by faculty, doctoral students, and postdoctoral scholars in the following areas:

1. Education of leaders not only in traditional disciplines but also in biomedical fields, new technology, business, government, industry, and humanitarian efforts;
2. Discovery, innovation, and understanding of breakthrough ideas;
3. Development of new research disciplines and technologies; and
4. Establishment of an educated populace that will ensure the success of the future.

To maximize impact and better reflect a changing U.S. population and a more global market, diversity must be a major component of all four values. Recruitment of doctoral students and postdoctoral scholars brings the opportunity — and responsibility — to increase the diversity of both current students and the future faculty who are being educated.

Doctoral education naturally draws students from around the nation and the world to Texas. International students are important for the state and the nation, particularly in STEM fields, because 80 percent remain in the United State as permanent residents and citizens. In 2005, 85-90 percent of doctoral recipients from China and India (the two largest contributors of U.S. international students) planned to stay in the United States.[7] Because of its geographic proximity and close existing ties, UT System institutions should seek mutually beneficial arrangements with Mexico and Latin America. With proper support, Texas and adjoining Mexican states have the potential to become the quintessential intellectual crossroads for bi-directional exchange of ideas, research, doctoral and postdoctoral students, and faculty, as well as commercial products between the U.S. and Latin America.

Supporting these values will increase the national and international reputations of the UT System universities, health institutions, and individual programs. These enhanced reputations will make it easier for Texas to attract new industry, as well as to recruit increasing numbers of high-quality faculty and students. The communities in which the universities and health institutions operate will experience increased prestige and the other collateral benefits such as quality cultural events, educational opportunities, and improved health services which come from first-rate universities. The increased earnings of those with doctorates will impact the state and local economies. The Texas Higher Education Coordinating Board reports that individuals with doctoral degrees earn on average over $3 million over their lifetime, compared to $1.8 million for those with only bachelor's degrees.

The Education of Leaders

A university is a community of scholars dedicated to advancing knowledge through research and educating the next generation of scholars. More and more today, leading executives and government officials have Ph.D.s. Technology companies, businesses, governmental organizations, biomedical enterprises, etc., need the entrepreneurial and critical thinking skills inherent in doctoral and postdoctoral education.[8] And, universities themselves cannot exist — cannot continue to educate the increasing numbers of students or conduct the complex research called for by leaders at the state and federal level — without a continuous replenishing of the existing faculty. And even as they work toward their degrees and becoming tomorrow's leaders, doctoral students are already playing a major role in teaching undergraduates and conducting research. Without them, universities would be unable to function.

Nearly one-third of the full-time faculty in Texas are over 55 years old. If the cultural, scientific, medical, and economic advances that our universities are making are to continue, these faculty must be replaced. Moreover, if the state is to reach its goal of closing the gaps and graduating hundreds of thousands of new students, the number of faculty teaching at colleges and universities must not only be greatly increased but also diversified to reflect the population of Texas.

Discovery, Innovation, and Understanding

A major contribution of the UT System to the competitiveness of the Texas economy is the creation and extension of knowledge that is currently taking place at the universities and health institutions in the System. In a knowledge-based economy, the System must capitalize on this advantage.

Cross-disciplinary research and, more importantly, trans-disciplinary research (research that transcends traditional disciplines) offer unparalleled opportunities to probe the unknown and to discover and understand new frontiers of knowledge. The UT System actively encourages strategic, faculty-driven collaborations among universities and health institutions; furthermore, the System has encouraged and facilitated the growth of new, ground-breaking doctoral programs. These actions have positioned the institutions and programs within the System at the leading edge of innovation.

Doctoral education, with its emphasis on individual creative research, encourages people to probe the unknown by taking calculated risks. At universities and health institutions, even a research project that does not yield the expected result can often lead to entirely different discovery and innovation. Tenure allows faculty the independence to experiment and to pioneer new techniques and knowledge.

Innovation depends upon bringing independent, diverse minds together. A steady infusion of new graduate students and postdoctoral scholars drives the engine of discovery. With the continuous influx of new understanding, universities and health institutions are uniquely poised to ensure that Texas as well as the nation are able to successfully compete in the global marketplace of products and ideas.

Research and Technology

Research and graduate education are intricately intertwined in the university — one cannot exist without the other — and both need to support each other if either is to be successful. Research laboratories become the classrooms as new technology is produced and new discoveries are made, often by bright graduate students and postdoctoral scholars.

The research at universities and health institutions has fueled local, state, and national economies. Industries have collaborated with institutions to produce life-saving technologies and improve communication through electronic means. Discoveries in the labs have become products in households. As the National Academies pointed out in "Rising above the Gathering Storm," technological change has been responsible for 85 percent of the growth in per-capita income in the United States (p. 3), and Texas must be ever vigilant to remain at the cutting edge of technology and research.

The UT System ranks fourth in the nation in patents — these patents are products of the work being done by researchers, doctoral students, and postdoctoral scholars at UT System universities and health institutions and of the education that is taking place at these institutions. Without continued and increased investment

in graduate education, the economy of Texas would become stagnant, and the state would not be able to attract and retain businesses and talented entrepreneurs.

Technology transfer benefits not only businesses but the entire state by generating new income and additional tax revenue. While the link between technology transfer and economic development is increasingly better understood and the subject of much attention, without basic research there would be no commercialization of technology. Universities, especially university infrastructure and personnel aimed at doctoral education, are primary producers of both basic and applied research. As Jorn Erselius, managing director of Garching Innovation which organizes technology transfer from the Max Planck Institutes to businesses in Germany has pointed out, major inventions — those which alter the course of an industry or have a profound impact on the world — are almost always derived from the results of basic research (EMBO reports, 2006). Texas must increase its strength in the basic research arena, generating increasing amounts of scientific discoveries and intellectual property.

Basic research and technology transfer is only one of the many benefits from doctoral and postdoctoral education at UT System institutions. Strong research initiatives at Texas' universities and health institutions attract human capital to the state in the form of researchers, postdoctoral scholars, and graduate students (as well as undergraduate students who want a degree from a first-rate, nationally renowned university). Moreover, strong research initiatives help to invigorate and retain the diverse demographic population already in Texas. Students and faculty alike want to be where the cutting edge really is the cutting edge.

Educated Populace

The salaries and lifetime earnings of those who achieve Ph.D.s are obviously higher than those who only obtain a bachelor's degree,[9] but those earnings are only a small (though important) advantage of graduate education. Intellectual collegiality and the acceptance of diverse viewpoints are important elements for doctoral research, and the analytic skills that doctoral students develop serve them throughout their lifetime, not only in the workplace but also in making everyday decisions.

At one time in America, having a high school education was considered a tremendous achievement. Later, having a bachelor's degree was considered the minimum requirement for many jobs. As society evolves, as knowledge advances, and as technology becomes more and more sophisticated, the value of a Ph.D. increases. Obviously, not everyone needs a doctoral degree, but those who do earn doctoral degrees are highly committed leaders in their professional and living communities. The benefits of the investments that institutions have made in the students and that the students have made in the institutions are incalculable in dollar terms — these benefits will determine the future of Texas and of the nation.

V. The Future of Doctoral Programs

To resist creative change and innovation in today's academic climate is to court disaster even if one's current programs are high quality. Resting on one's laurels without actively seeking innovation and improvement will not attract the best faculty or the best students, will not develop the most competitive programs, and will not drive institutions to aspire to greatness or work effectively to achieve it.

Major research universities are all looking to the future and asking similar questions about new program development and changes in existing programs: What do we need to do in order to (continue to) attract an outstanding, diverse faculty and student population, compete for funding, and ensure that graduates find success in the job market? What are the nature and context of the next generation of areas for education and research where we must invest our resources?

Clearly, UT System academic and health institutions must constantly be looking for creative, effective, productive, and marketable doctoral education trends to remain contemporary and competitive. There are a number of general areas of consideration for future development of new programs that will put UT System on the cutting edge of research and education.

About 25 years ago, a new trend toward more cross- and trans-disciplinary research emerged to challenge the traditional premise that the best way to educate graduate students was concentrating in both concept and technology in very defined disciplinary areas. Since then, many classical programs have been replaced with trans-disciplinary, or thematic, programs that provide education and experience in more than one discipline or set of technologies.

Even though this transition to trans-disciplinary programs has been ongoing for many years, there still remain many areas with room for improvement or growth. And, as science and technology and our society expand and grow more complex, there are areas that are still waiting to be discovered. Institutions — and the UT System — must remain both vigilant in watching for these emerging areas and active in creating new ones in areas where there is already strength.

Doctoral-Doctoral Programs. In this area, two (or more) traditionally separate doctoral programs come together. UT System should encourage institutions to demonstrate creativity in program design, making connections — both within institutions themselves and with external partners — between disciplines that will lead to new ways of thinking about a problem.

Doctoral-Professional Programs. In this second type of trans-disciplinary program, a professional discipline such as medicine, dentistry, law, or business merges with doctoral studies in more fundamental disciplines. This leads to practitioners with a better understanding of research and the impact of new knowledge on the profession and to researchers with a better understanding of the application of knowledge. In the end, the effectiveness of these programs will hinge on the ability of the graduate to make a contribution to the knowledge/technological base of the professional discipline.

Doctoral-Translational Programs. In this type of programmatic development, the key rationale for the program is the translation or application of basic scientific research to practical issues. Health institutions are combining their efforts with research at academic universities in areas such as engineering, hard science and math, and especially the social sciences and humanities, in attempts to improve the translation of science from the research bench to the bedside and then to the community. Another sphere of translational, or applied, research for potential program development is in the area of biotechnology — where the merging of biology and several types of engineering are the congealing points for new programs.

Whenever it seems that every possible type of educational program has been established, something very innovative appears. As society changes and its needs evolve, education and research too must evolve to discover the knowledge that will help society meet new challenges. UT System institutions must establish and maintain an intellectual environment where new programs can be planned and piloted in a tenacious effort to achieve a leadership position in the nation/world.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

Ultimately, we must challenge our faculty and institutions, allow them the freedom to experiment, and enable them to inspire and excite the next generations of scholars. Not every idea or new program will be wildly successful, but some will, and those will make us be seen as operating on the cutting edge of education and research and as a great place in which to invest time, energy, and future prospects. This is the vision that underlies the Task Force recommendations, and one UT System institutions can achieve by adopting them.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

VI. Recommendations for Doctoral and Postdoctoral Education in the UT System

Doctoral education differs significantly from undergraduate education, and postdoctoral education is yet more different. The value that this education brings – to the individual, the program, the institution, the region, the state, and the nation – is indisputable. And the future of education and research is already here; UT System must actively pursue a leadership position to recruit and retain the highest quality faculty and students.

To help UT System meet this potential – to compete for talented, highly capable students, to work on cutting-edge research, deliver the best patient care, and to educate the men and women that will be tomorrow's leaders – this Task Force has created a list of 10 major recommendations in four general areas:

A. UT System and Institutional Planning and Organization
B. Recruitment and Success of Doctoral Students and Postdoctoral Scholars
C. Faculty and Educational Programs
D. Mentoring, Professional Skills and Socialization, and Career Development

As noted previously, the Task Force arrived at these recommendations after extensive focus group discussions with faculty, administrators, and students from the UT System. Each recommendation has significant value and would independently enhance doctoral and postdoctoral education. However, implementation of all the recommendations would create enormous synergy. Taken as a set, and provided the necessary resources, they would propel the institutions of the UT System to a new level of competitiveness and excellence within the coming decade.

Summary of Major Points of Emphasis

The UT System must:

- Prominently address doctoral and postdoctoral education in major UT System planning and accountability efforts.
- Provide health benefits equivalent to those received by faculty and staff for all full-time doctoral students and postdoctoral scholars who receive stipends or salaries.
- Develop mechanisms to increase the recruitment and success of outstanding, diverse doctoral students and postdoctoral scholars.
- Use external peers to conduct rigorous reviews of proposals for new and ongoing doctoral programs.
- Facilitate and support the development of trans-disciplinary research educational programs.

UT System institutions must:

- Explicitly include doctoral and postdoctoral education in planning, budget preparation, evaluation, and external communications.
- Disseminate expectations and commitments, including major milestones and anticipated timelines for progression to beginning independent dissertation research (i.e., candidacy) and completion of degree requirements.
- Use external peers to conduct rigorous reviews of proposals for new and ongoing doctoral programs.
- Include expectations and rewards for doctoral and postdoctoral education in tenure and promotion guidelines for faculty members and support the ongoing development of required skills.
- Facilitate and support the development of trans-disciplinary research educational programs.
- Ensure that doctoral and postdoctoral education prepares graduates for a wide range of careers, professional environments, and trans-disciplinary interactions and efforts.
- Incorporate doctoral students and postdoctoral scholars more fully into the community of scholars on university campuses.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

Recommendations

A. UT System and Institutional Planning and Organization

1. **Doctoral and postdoctoral education must be prominently addressed in major UT System planning and accountability efforts.**
   - The UT System must develop a strategic plan for doctoral and postdoctoral education that addresses state and System needs, the costs and financing of these programs, and the adequacy of legislative support provided by formula funding and other mechanisms for education in all approved institutional programs.
   - The UT System must require that its institutions include doctoral and postdoctoral education in compacts, accountability reports, presidential work plans, and any institutional strategic plans. Particular attention should be paid to the adequacy and stability of resources and financial support for both ongoing and proposed new programs.
   - Knowledge and experience in doctoral and postdoctoral education must be included as a criterion for selection of institutional presidents, and the evaluation of presidents and other institutional leaders must include meaningful input from graduate faculty, doctoral students, and postdoctoral scholars.
   - The UT System must develop a central resource to identify and disseminate information relevant to doctoral and postdoctoral education, to coordinate system-wide activities, and to share best practices and available resources. The System should be a catalyst for development of innovative programs and collaborations to support its strategic goals.
   - The UT System Office of External Relations must establish a continuing effort to inform leaders in government, industry, the philanthropic community, and the general public about the value and importance of doctoral and postdoctoral education.
   - When institutions identify employment practices and policies that hinder the recruitment and support of doctoral and postdoctoral employees, The UT System Office of General Counsel must lead efforts to revise System and legislative policies and practices that have a negative impact.

2. **Doctoral and postdoctoral education must be explicitly included in institutional planning, budget preparation, evaluation, and external communications.**
   - Doctoral and postdoctoral education programs must be included (explicitly or implicitly) in mission and vision statements, and explicitly in institutional goals, appropriate public documents (e.g., catalogs and websites), and external communications.
   - In planning and evaluation, particular attention must be paid to the adequacy and stability of resources and financial support for both ongoing and proposed programs, and to rigorous evaluation of the quality of graduate and postdoctoral education. Resources must be adequate to ensure programs will be competitive with peer institutions.
   - Institutions that provide or plan to provide a significant amount of postdoctoral education must have a postdoctoral office with designated responsibility and authority.
   - The graduate faculty, leaders of postdoctoral programs, doctoral students, and postdoctoral scholars must have meaningful input into strategic plans, compacts, and other major institutional planning activities.
   - Institutional planning must explicitly address recruitment and success of underrepresented minorities in doctoral and postdoctoral education programs.

B. Recruitment and Success of Doctoral Students and Postdoctoral Scholars

3. Institutions must disseminate expectations and commitments, including major milestones and anticipated timelines for progression from matriculation to post-candidacy and beginning independent dissertation research through completion of degree requirements.

- Graduate faculties should develop clear, written statements of expectations and commitments for both faculty members and doctoral students and postdoctoral scholars.
- These expectations and commitments should be prominently displayed in institutional materials, provided to prospective students, and discussed jointly by faculty members and students when they matriculate and at key, defined points in doctoral and postdoctoral education programs.

4. All UT System institutions must provide health benefits equivalent to those received by faculty and staff for all full-time doctoral students and postdoctoral scholars who receive stipends or salaries.

- The UT System must lead efforts to remove the 90-day waiting period and restore full state funding for health benefits of doctoral students who work 20 or more hours a week that were in place prior to the 78th Texas Legislature.
- Health care benefits must include counseling, mental health services, and maternal health benefits.
- UT System and institutional appointment and employment policies must not decrease health benefits of doctoral students and postdoctoral scholars who are awarded individual fellowship or training grant support and must ensure that loss of benefits is not an impediment to obtaining these awards.
- The UT System should consider if it would be cost effective to include graduate students and postdoctoral scholars in faculty and staff health insurance plans and/or to develop a System-wide plan(s) that would include them.

5. The UT System must develop mechanisms to increase the recruitment and success of outstanding, diverse doctoral students and postdoctoral scholars.

- In order to increase and diversify the pool of outstanding applicants, the UT System is encouraged to continue efforts to develop a database of undergraduates enrolled at all UT System institutions who are prospective doctoral students, to expand it to include undergraduates at other state and U.S. universities, and to develop a comparable database for doctoral students at UT System institutions who are prospective postdoctoral scholars.
- The UT System must provide financial support for summer research and other programs that increase the number of Texas residents well prepared to enter doctoral programs and attract outstanding residents and non-residents to doctoral programs at UT System institutions. These should be competitive programs that target high-priority areas identified in System strategic plans, and all UT System institutions with doctoral programs should be eligible to apply. It is recommended that support be provided annually for a minimum of 500 participants.
- Institutions should develop financial and educational support mechanisms for capable students from diverse and traditionally underserved backgrounds who may require additional time and preparation to reach post-candidacy status and begin independent doctoral research.
- The UT System must develop a highly competitive program of individual "Regents' Fellowships" to attract the most outstanding undergraduates from Texas and elsewhere to UT System institutions for doctoral research studies that support the System's strategic goals. At least 200* new four-year fellowships must be awarded annually to elevate the UT System to the most competitive level.

* This number represents approximately 10% of total doctoral students enrolled at UT System institutions. It was felt that this level of increase was required to have a significant impact on the overall competitiveness of UT System institutions.

- The UT System must develop a highly competitive program to attract the most outstanding Ph.D. graduates in the world to UT System institutions. A minimum of 100* new two-year awards must be made annually to elevate the UT System to the most competitive level.
- The UT System should coordinate state, national, and international marketing efforts to increase the recognition of doctoral and postdoctoral education opportunities at its institutions as the quality of UT System programs is not always recognized and this factor impedes recruitment of the most talented and capable students.

C. Faculty and Educational Programs

6. The UT System and its institutions must conduct rigorous reviews of current programs as well as proposals for new programs.

- Initial institutional- and subsequent System-level reviews must include rigorous evaluation by highly qualified, credible reviewers from outside the institution.
- Reviews should establish that programs are in line with System and institutional strategic plans and that adequate and stable funding and resources are available.
- Reviews should verify by objective criteria that ongoing programs have a critical mass of productive research faculty, an adequate research infrastructure, an appropriate curriculum, and a critical mass of qualified students and postdoctoral scholars as appropriate.
- Reviews should verify that institutions have a sufficient support system and infrastructure to meet the professional, career development, and individual needs of doctoral students and postdoctoral scholars.

7. Institutions must include expectations and rewards for doctoral and postdoctoral education in tenure and promotion guidelines for faculty members and support the ongoing development of required skills.

- Relevant promotion and tenure guidelines and job descriptions must recognize contributions to educational programs including didactic instruction, research supervision and advising, and professional development and socialization. These guidelines should also be used in performance evaluations.
- Institutions should provide assistance for faculty members to acquire needed skills. This should explicitly include financial support for faculty members at all career stages to acquire new skills and training to enable them participate effectively in research and doctoral and postdoctoral education.

8. The UT System and its institutions should facilitate and support the development of trans-disciplinary research educational programs.

- The UT System should provide funding to develop and support trans-disciplinary education programs for doctoral students and postdoctoral scholars in priority research areas identified in System strategic plans. Funding should be provided for at least two major programs each year in areas identified as high priority in the UT System Strategic Plan (e.g., in the 2006-2015 Strategic Plan these areas were Health Research in Cancer, Infectious Diseases, and Diabetes; Drug Diagnostics and Development; Security Issues; Energy; National Labs, e.g., Sandia; Information Technology; Nanotechnology and Nanoelectronics).
- Institutions should develop administrative procedures and reward systems that explicitly recognize educational and research contributions of faculty members and academic units to trans-disciplinary programs and remove administrative impediments to these activities.

* This number represents approximately 10% of the estimated number of postdoctoral scholars at UT System institutions based on NSF data, and is again the number the Task Force believes is required to have a transformational effect on collective UT System programs.

D. Mentoring, Professional Skills and Socialization, and Career Development

9. Doctoral and postdoctoral education must teach graduates critical thinking and problem solving and prepare them for a wide range of careers, professional environments, and trans-disciplinary interactions and efforts.

- Institutions should make training available to enhance grant, publication, and other professional writing; oral communications and presentations; teaching; and professional, leadership, and management skills needed to effectively lead a wide range of programs and a diverse workforce.
- Institutions must provide advising to make doctoral students and postdoctoral scholars aware of the full range of professional careers beyond traditional academic careers and must aid with job-seeking skills and strategies.
- Opportunities to attend and present at professional meetings should be encouraged.
- All doctoral students and postdoctoral scholars must receive training in ethics and professional behavior.
- Alumni tracking and surveys should be used to evaluate long-term career success for program evaluations.

10. Incorporate doctoral students and postdoctoral scholars more fully into the community of scholars on university campuses.

- Institutions must establish formal conduits for interaction between doctoral students, postdoctoral scholars, faculties, administrators, and institutional leaders.
- Faculty members must be able to obtain needed information and skills and to incorporate them into their research and educational efforts to communicate, mentor, effectively supervise, and productively interact with diverse groups of students and faculty in a wide range of disciplines.
- Institutions must include doctoral students and postdoctoral scholars in governance as appropriate (e.g., a spot on standing committees) and in evaluations of faculty, programs, administrative structures and services, and institutional leaders.
- Institutions and programs should establish mechanisms to recognize mentoring and career development activities and include doctoral students and postdoctoral scholars in the design of the process and identification of faculty to be recognized.
- Faculty and administrators must treat doctoral students and postdoctoral scholars with the respect shown to colleagues and welcome them into the community of scholars.

This report includes several appendices relevant to these 10 recommendations. Two that were previously mentioned, *Guidelines and Best Practices* and *Impediments and Critical Areas for Improvement,* can aid UT System, institutions, and individual programs in implementing recommendations and assist them in future planning. *Cost Estimates for Implementation of Recommendations* illustrates new funding that would be needed to implement recommended programs for summer undergraduate research, Regents' doctoral fellowships, incentives for recruitment of postdoctoral scholars, grants to establish new trans-disciplinary training programs, and provision of health benefits. Also included is *Background and Benchmarks: Graduate and Postdoctoral Education* to provide a historical perspective and current examples of quality indicating benchmarks from other leading institutions.

VII. The Next Step: A UT System Strategic Plan for Graduate Education

Implementation of some of these recommendations could begin in a relatively short time without the need for substantial new resources. For example, UT System and institutions could more explicitly include doctoral and postdoctoral education in planning documents, many of which are updated on an annual or biannual basis. Another over-arching theme that permeates several recommendations is the need for rigorous and meaningful peer review of programs at all levels — the will to adopt this practice is more important than a substantial increase in funding. While these examples are not trivial issues and some planning effort would be required, implementing these and other recommendations could begin soon after adoption.

Implementing other recommendations would require substantial increases in funding, culture changes within the System and institutions, new facilities and infrastructure modifications, or other significant changes that require substantial planning time and resources. The timing of implementation of specific recommendations will thus be variable.

Recommendations dealing with the UT System's strategic planning deserve special mention. Implicit in the formation of this Task Force was that the report would be the starting point for development of a UT System strategic plan for doctoral and postdoctoral education as called for in the Board's strategic plan. At the institutional level, strategic planning is more focused on specific programs and the unique aspects of each campus, but at the System level a strategic plan would emphasize principles to provide a more overall level of guidance. Examples might include:

- Commitment to quality and competitiveness
- Provision of adequate and stable resources
- Mandating rigorous program reviews that involve both external peers and internal colleagues
- Diversity and inclusiveness
- General guidelines for overall System growth and enrollment
- Retention, success, and time to degree or program completion for doctoral students and postdoctoral scholars
- Ensuring that metrics and accountability are in place and evaluated regularly
- Providing broad guidelines for determining institutional missions
- Regional considerations in plans for doctoral and postdoctoral education
- System policies that impact doctoral and postdoctoral education

Many of these features would apply to all programs, but a strategic plan will depend in some ways on the System's long-term goals and aspirations. For example, what strategic areas does the System want to strengthen and/or develop? What is a realistic timeframe for such developments? What are the most important factors that motivate the current and rising generations of doctoral students and postdoctoral scholars? How can we prepare our faculty and institutions to understand and apply these drivers appropriately? What are the learning styles and preferences of future generations of research scholars? Do we have the infrastructure in place to support and capitalize upon these learning styles? To what degree should regional considerations affect the location of new doctoral and postdoctoral programs?

To initiate the strategic planning process we recommend that the UT System plan and develop a system-wide symposium with invited national and international leaders in doctoral and postdoctoral education, as well as UT System participants, to further support development of a strategic plan for these programs. This symposium would then be a recurring event to highlight UT System's commitment to becoming a global leader in this arena and a means to implement the recommendation that the quality of our doctoral programs be more widely marketed in the U.S. and around the world. At the same time, it would provide a forum for UT System institutions to share ideas and best practices, to develop mutually beneficial partnerships, and become more visible leaders in doctoral and postdoctoral education.

As emphasized earlier in the report, encouraging innovation and creativity in doctoral and postdoctoral education and maintaining a dialogue and examination of our programs in the spirit of continuous quality enhancement must be an ongoing process for all institutions and should include System leadership and

involvement. The overall purpose of this report is to identify ways in which the UT System can initiate major improvements in graduate education in the state of Texas by collecting best practices so that the System is prepared to take the next step of developing a strategic plan by 2008.

This plan must set forth specific initiatives to expand and enhance doctoral research and education and the postdoctoral experience and will call for specific action items to fulfill those initiatives. A strategic plan, in and of itself, will not ensure success; therefore by 2009 (before the next legislative session), an implementation plan with a realistic budget and timeline must be put in place to make certain that there is a clear path and substantial means to serve the educational and research needs of Texas in today's creative, knowledge-based economy. Only then will the UT System be positioned to achieve its strategic goals of enhancing student success; improving the diversity of students and faculty; increasing research, global competitiveness, and technology transfer; and improving health in Texas.

The development of a UT System Strategic Plan for Doctoral and Postdoctoral Education is the next critical step on the pathway to enhancing competitiveness, but even the best plan will not produce a significant impact without another essential ingredient — the graduate faculty. As emphasized by the Council of Graduate Schools, "The quality of the graduate faculty is the single most important factor in the establishment and maintenance of an excellent program leading to the Ph.D. degree."[10]

Sustained excellence requires that faculty, doctoral students, and postdoctoral scholars be involved in planning and evaluation as noted throughout this report's recommendations. The graduate faculty must also play a key role in recognizing new opportunities, developing new programs, and participating in the academic governance in their institutions. Therefore, graduate faculty members should be encouraged to be as innovative and creative in the educational arena as in their research, and they must be allowed to do so. Doing so will invigorate the communities of scholars within the UT System and make our institutions places where the most talented, motivated students, the most outstanding senior faculty, and the most capable individuals at all levels in between will want to come. This is the future the Task Force envisions once the recommendations are implemented.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

APPENDICES

APPENDIX 1

Guidelines and Best Practices for Building and Maintaining Competitive Doctoral and Postdoctoral Education Programs

A number of excellent doctoral and postdoctoral programs currently exist at UT System institutions. They have produced outstanding graduates who have made important contributions in many fields and brought credit and recognition to UT System. However, the state and System are now faced with major demographic shifts, fierce competition for decreasing federal resources, and a rapidly changing global economy. This report makes a number of recommendations intended to apply broadly to the UT System and all of its institutions, both academic and health-related.

From our discussions with faculty, administrators, and students, it became clear that realizing the benefits of the Task Force recommendations would require that certain basic commitments and features be in place at institutions and within academic programs. This appendix defines the key features of competitive programs and makes suggestions to ensure that all UT System's doctoral and postdoctoral programs possess them in order to obtain maximum benefit from the Task Force recommendations.

This appendix provides a useful guide to aid institutions and the System in evaluating proposals for new programs and the ongoing review or substantive changes in existing ones. These desired features apply broadly to research-based Ph.D. programs in all fields and at all institutions, although there may be others that apply to limited subsets of programs or disciplines.

While this report was in preparation, the UT System Student Advisory Committee independently recommended that a set of best practices be developed for graduate education at UT System institutions. While the following set of practices was intended to apply specifically to research-based *doctoral and postdoctoral* programs, it seems likely that most, if not all, are also best practices for a wider range of *graduate* programs.

A. The UT System and Institutional Planning and Organization

Institutions must:

1. Explicitly include doctoral and postdoctoral education as part of an institution's mission and/or vision statement. It must be clear at all levels within the institution and to all external constituencies that the education of doctoral students and postdoctoral scholars is a core component of its mission that deserves appropriate support, recognition, and attention for its own sake. Doctoral and postdoctoral education programs cannot be highly competitive if they are viewed as a secondary mission of the institution or as a mechanism that primarily supports other functions or needs (e.g., to recruit faculty, conduct research, teach undergraduates, etc.).
2. Formally assign responsibility for oversight, along with appropriate authority and resources, of doctoral and postdoctoral education. In most institutions, the dean of the graduate school is designated as the responsible party for doctoral education. There are many models for organization and reporting structures of graduate schools, including interactions of the graduate dean with individual colleges and academic departments as well as the provost and president of the institution. In all cases essential ingredients for success are clearly understood lines of reporting and responsibility, assignment of appropriate authority, and provision of sufficient staff support and resources at each level.

   Each institution that offers postdoctoral education should have a formal training program with designated responsibility, authority, and support for this mission. In some cases this may be the dean of the graduate school, but if so, care should be taken so that postdoctoral education has its own identity and is perceived as having independent value. Regardless of the exact reporting structure, these institutions should have a highly visible, proactive postdoctoral office; the responsible party should be a strong leader, advocate, and spokesperson for all aspects of postdoctoral education; and he/she should be highly visible within the institution.

The need for formal oversight of postdoctoral education at UT System institutions is underscored by the current call for change at the federal level. The National Science Foundation Authorization Act of 2007 (H.R. 1867) before Congress includes a new section on postdoctoral scholar mentoring. The NSF may require institutions that have postdoctoral scholars supported by NSF research funds to have postdoctoral career development programs. If this significant legislation passes, all UT System institutions (all *U.S.* institutions) having NSF research funds would be required to have postdoctoral mentoring programs. Also, it is likely the NIH, USDA, and other federal agencies will follow the lead of NSF.

3. Provide adequate infrastructure to support graduate and postdoctoral education. An essential prerequisite for competitive programs is a faculty publishing high-quality research, and this requires an infrastructure to support the research and scholarly enterprise. This includes space, start-up funds, adequate research office staffing, teaching releases, etc. Furthermore, competitive research programs require the ability to attract high-quality doctoral and postdoctoral students.

   In addition, there is a need to provide support and services to doctoral students and postdoctoral scholars. These include health benefits, counseling, and recreation; housing, childcare, and family support; support for international students; as well as traditional academic services (e.g., registrar, financial aid, etc.). As doctoral students and postdoctoral fellows are also university employees, payroll and benefits, compliance training, and other employee services must also be provided. These services may differ substantially from those of undergraduate students.

4. Include doctoral and postdoctoral education as an integral part of the institution's strategic plans, UT System compacts, presidential work plans, and accountability reporting. Institutional support and planning for doctoral and postdoctoral education must be an ongoing process embedded in institutional strategic plans, performance evaluation, accountability, and continuous quality enhancement functions. This begins with a rigorous intra-institutional review of proposals for new programs or substantive modifications of existing ones and involves regular assessments of ongoing programs. Both should involve rigorous peer analysis by individuals outside the institution.

   Strategic planning should include provision of adequate initial resources (e.g., faculty, facilities, institutional infrastructure, and operating expenses) and realistic plans for stable ongoing support. The UT System and the Texas Higher Education Coordinating Board (THECB) should develop system and statewide strategic plans for doctoral and postdoctoral education, and individual institutional plans should be consistent with these.

5. Explicitly include programs and initiatives to increase local/diverse student and faculty recruitment and retention in strategic plans, UT System compacts, and accountability reporting. Institutional support, initiatives, and planning for increasing the participation of underserved populations must be an ongoing process embedded in institutional strategic plans, performance evaluation, and accountability. Strategic planning should include provision of adequate initial resources and realistic plans for stable, sustainable support of such initiatives. The UT System and the THECB should develop system and statewide recruitment plans for minority faculty, and individual institutional plans should be consistent with these.

   Examples of recruitment strategies for doctoral students, postdoctoral scholars, and faculty:

   - Sending institutional representatives to minority science conferences (e.g., the Society for the Advancement of Chicanos and Native Americans in Sciences, American Indian Science and Engineering Society, etc.)
   - Establishing innovative long-term agreements with minority serving institutes by guaranteeing admissions for qualified candidates
   - Awarding competitive fellowships that are attractive to diverse and underrepresented applicants
   - Establishing target faculty recruitment initiatives.

Examples of retention strategies to guarantee success of the initial investment in recruitment:

- Creating bridge programs to build minority cohorts for successful transition into graduate school.
- Developing additional training initiatives throughout each institution.
- Establishing an office and/or designating individuals responsible for minority student success.

B. Recruitment and Success of Doctoral Students and Postdoctoral Scholars

The rewards far exceed the cost required to recruit and retain the best graduate students and postdoctoral scholars. Without a substantial investment in recruiting activities, in advertising program successes, and in financial support, it is not possible to create or maintain competitive, first-rank programs.

Competitive graduate programs must:

1. Recognize that the key to program success — as measured by the research accomplishments of program faculty and the success of doctoral students and postdoctoral scholars in obtaining employment — is the ability to recruit and retain top people at every level. Top doctoral students and postdoctoral scholars possess the following qualities: intellectual maturity and stamina; intense motivation to learn collaboratively and individually; intellectual integrity; superior intellectual competence including critical thinking, problem solving, communication skills, and analytical ability; the potential for leadership; and the ability to work with a team.
2. Recruit nationally and internationally.
3. Generate important new knowledge that is widely and rapidly acknowledged and used. Then graduate significant numbers of students who become leaders in their fields and communities and who generate income through extramural research funding and fellowships.
4. Maintain a reputation for excellence that increases the ability to attract the best applicants from each year's national applicant pool.
5. Market effectively the quality of programs to the best prospective applicants already committed to doctoral and postdoctoral education and effectively engage capable students who may not have previously considered advanced education. This dual approach is essential to recruit excellent, diverse students in all disciplines and to dramatically increase the numbers of doctoral students and postdoctoral scholars in STEM fields and other strategic areas.
6. Plan for and anticipate changing demographics and job opportunities of the nation and the state of Texas. This requires recruiting students who have the potential to become outstanding researchers and teachers and who will serve as role models for educating Texans of all ethnic, cultural, and economic backgrounds. The best applicants are often attracted to trans-disciplinary and newly emerging areas, and competitive graduate programs must be able to adapt to the changing demands of the communities they serve.
7. Provide competitive stipends, benefits, and stable support for the duration of time needed to complete the doctoral degree and postdoctoral education. There is keen competition among leading universities to attract the best students nationally and internationally. Recruiting these students requires competitive and stable support for the entire education, period. Support is essential to maximize retention, increase graduation rates, and decrease the time required to complete professional education and begin an independent career. Institutional support and philanthropy are essential for stable support of doctoral students and postdoctoral scholars in the current funding climate.
8. Create a highly interactive community of scholars in which doctoral students and postdoctoral fellows are considered to be essential and allowed to participate to the full extent that is appropriate.

9. Have a critical mass of faculty, doctoral students, and postdoctoral scholars committed to discovery research, an environment that values creation of new knowledge, and an organizational framework and atmosphere that foster collegial interactions among all these individuals. This allows faculty members and doctoral students and postdoctoral scholars to understand each others' expectations and commitments, and share responsibility for progressively developing trainees as independent scholars. In successful programs, doctoral students and postdoctoral scholars are treated with dignity and respect appropriate for future professional colleagues, and their contributions are valued and acknowledged. This aids recruitment, retention, and program completion rates and increases research competitiveness of the institution.

C. Faculty and Educational Programs

Institutions and/or Programs must:

1. Have a critical mass of active research faculty who are committed to doctoral and postdoctoral education. There is a sufficient number of productive faculty to establish and maintain research programs consistent with an institution's strategic plans, and the institution provides sufficient support to enable a program to be highly competitive with programs in its institutional peer group[1]. The faculty has adequate skills in research training and mentoring as well as expertise in their discipline to be effective instructors, research advisors, and mentors to doctoral students and postdoctoral scholars. The number of faculty needed for a critical mass in any program is variable but is nevertheless essential to provide the knowledge base and intellectual environment to train Ph.D.s and postdoctoral fellows.
2. Recognize and reward the education of doctoral students and postdoctoral fellows at all levels (e.g., department, school, university) with tenure, promotion, salary, and other appropriate forms of recognition. The institution assigns an appropriate percent work effort and whenever possible the provision of a corresponding funding source for doctoral and postdoctoral education activities including didactic instruction, research supervision, mentoring, and career development activities. The institution assesses the quality as well as the quantity of these contributions. Overall evaluations are weighted to consider the percent work effort devoted to doctoral and postdoctoral education.
3. Assess the enrollment size and quality of doctoral and postdoctoral programs in light of its mission, strategic planning, and financial resources. Program enrollments are reviewed in an ongoing fashion to ensure they remain in line with strategic goals; have a critical mass of faculty, doctoral students, and postdoctoral scholars; have sufficient resources; and remain competitive. Evaluations — involving both internal and external peer review, input from doctoral students and postdoctoral scholars, and career outcomes of alumni — are conducted regularly to insure quality is maintained and that programs remain competitive. Institutions have ongoing review mechanisms in place that would be appropriate for this purpose if rigorously conducted. The UT System might consider ways to support these efforts, e.g., by identifying and arranging for peer reviewers and providing support for reviews.
4. Encourage, facilitate, and support trans-disciplinary programs. The ability to develop trans-disciplinary programs increases an institution's flexibility to respond to changing research priorities and funding patterns. Development and support of trans-disciplinary programs is considered in institutional planning and evaluation processes, the institution provides appropriate resources, and faculty contributions are appropriately recognized and rewarded. Responsibility and authority for oversight of trans-disciplinary doctoral and postdoctoral program is designated.
5. Have an adequate infrastructure and support for doctoral and postdoctoral programs. Institutions and programs have an adequate infrastructure to support the overall doctoral and postdoctoral program(s), including the needs of doctoral students, postdoctoral scholars, and faculty, as well as an adequate infrastructure to support research and research training elements.

6. Have clear guidelines for expectations, milestones, and timelines for completion of the doctoral degree and postdoctoral education and these are effectively communicated to students and faculty. This information is included in catalogs and other information provided to prospective students and the public. All trainees and faculty share a common understanding of the general expectations and timelines. This information is provided to new students and faculty members and periodically reinforced at appropriate times throughout the program(s).

D. Mentoring, Professional Skills and Socialization, and Career Development

Programs must:

1. Provide training in critical thinking, problem solving, communication skills, group dynamics and management, ethics and professional behavior, as well as advanced training in the area of specialization. These are increasingly important elements for career success of alumni, appropriate professional behavior, and effective leadership in all disciplines. Critical thinking and problem solving skills are essential for creativity and innovation which is the basis for competitiveness in the global information economy that is increasing in size and complexity.
2. Help doctoral students, postdoctoral scholars, and faculty become aware of the range of career opportunities for those with doctoral degrees. Graduates will be needed for academic positions to meet the educational needs of the state, but many will enter non-academic positions in government and the private sector. Awareness of the full range of opportunities is important to increase the numbers of students seeking advanced training in STEM and other priority areas and to guide their academic preparation. Faculty need to be aware of careers their graduates will enter to develop appropriate student learning outcomes and desired competencies.
3. Provide curricula, career development opportunities, and other training activities to prepare graduates for a wide range of positions in academia, government, and private business. Faculty should provide training to achieve desired student learning outcomes and competencies that prepare them for a wide range of careers, including both academic and non-academic positions, they will assume in the future.
4. Understand, along with individual faculty and the institution as a whole, the importance of mentoring and accept it as a shared responsibility. Mentoring and career development are seen at all levels as shared responsibilities that are important components of doctoral and postdoctoral education. Institutions should have assistance available for faculty and leaders to enhance their mentoring and advising skills. The mentoring abilities of the faculty should be assessed in faculty evaluations, and a concrete merit system should reward faculty for good mentoring.
5. Support the transition of doctoral students and postdoctoral trainees to the next stage of their careers and throughout their professional lives. Programs and faculty advisors support their trainees as they pursue advanced education and the independent professional careers of their choice.
6. Provide an evaluation mechanism to monitor and enhance continued development of faculty in all areas including mentoring, researching, and teaching. Faculty members should be afforded every opportunity to advance their knowledge base in areas critical to their respective fields. Evaluations are a key component of this continuing development, but protected time for faculty to engage in intellectual advancement is also vital.
7. Foster an intellectual environment that stimulates independent thinking while maintaining an emphasis on the welfare of students and postdoctoral fellows. Though hard to quantify, the most productive and inspired doctoral students and postdoctoral fellows are those that are part of a supportive and engaging environment that values their contributions. Many factors impinge upon a successful intellectual environment, but an emphasis on quality students and postdoctoral fellows rather than quantity, while increasing the diversity of the same, is a focal point. In addition, the institution provides conduits for discussion between graduate students, postdoctoral fellows, faculty, and administration.

APPENDIX 2

Impediments and Critical Areas for Improvement

Based on broad input from the UT System institutions, along with consideration of best practices, state and national trends, and comparisons with other universities, the Task Force identified a number of impediments to enhancing doctoral and postdoctoral education, key areas for improvements, and other related concerns. Not every impediment will exist at every institution, but the Task Force strongly recommends that presidents and other leaders carefully consider whether these impediments may exist on their campuses and take corrective action if necessary.

A. UT System and Institutional Planning and Organization

1. The general public, and in some cases, the full institutional community do not recognize doctoral and postdoctoral education as a core mission of the institution nor understand its value to the institution and society. These programs are not always visible in descriptions of institutional missions.
2. The UT System and THECB do not have adequate strategic plans for doctoral and postdoctoral education. Lack of plans makes planning; operation; funding; and assessment of workforce, institutional, System, and state needs problematic and does not help institutions to plan recruiting and admissions.
3. Doctoral and postdoctoral education is not always adequately addressed in strategic plans, compacts, presidential work plans, and accountability reports. The interests and needs of these programs may be overshadowed by undergraduate programs on academic campuses and by clinical issues on health-related campuses. Evaluation of presidents and senior administrators may not explicitly address achievements in doctoral and postdoctoral education or include meaningful input from graduate faculty, doctoral students, and postdoctoral scholars.
4. Institutional strategic plans do not realistically address funding for doctoral and postdoctoral education, including initial start-up costs and sources of stable ongoing support. Plans for new programs do not always adequately address the cost to recruit and retain competitive faculty, the infrastructure needs for research and graduate education, or the need for stable support of doctoral student stipends. Plans for continued operation of existing programs do not always adequately address the stability of support necessary to maintain and improve quality and competitiveness.
5. In some cases, graduate schools and deans are seen as 'subservient' to other offices and interests, and may not have sufficient resources and stature within an institution's organizational structure. Institutions may not have a senior administrative leader and/or office for postdoctoral education with sufficient responsibility, authority, and resources to provide needed services.
6. Student stipends, benefits, and incentives are variable among and within UT System institutions and are inadequate in some cases. There is a special need to provide adequate health benefits, comparable to those received by faculty and staff, to all full-time students and postdoctoral scholars who receive a stipend or salary.
7. Initiatives and programs to increase diversity and inclusiveness of historically underserved populations (both faculty and trainees) are often under funded, inconsistently implemented, not well coordinated at the System and institutional levels, and are not linked to K-16 programs.

B. Recruitment and Success of Doctoral Students and Postdoctoral Scholars

1. The high quality of doctoral and postdoctoral education programs at UT System institutions is not always universally well known in the academic, research, and business communities.
2. There is not a central mechanism to readily identify undergraduates at UT System institutions and other Texas schools who are considering doctoral study, or for such undergraduates to easily obtain information about graduate programs at all UT System institutions.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

3. Prospective graduate students and postdoctoral fellows from other states and countries may not appreciate that the cost of living in Texas is far less than other parts of the country, and this perception may make stipends and benefits in the state appear less attractive than they are.
4. Student stipends and benefits are not competitive at all UT System institutions. Low stipends are more common at academic rather than health institutions. The lack of health benefits comparable to those of faculty and staff is highly problematic at some institutions.
5. Even in cases where annual stipends are competitive, UT System institutions do not generally "guarantee" students stable support for the full time to complete the doctoral degree; this is becoming more problematic as other top-tier institutions are increasingly offering such long-term support.
6. As competition for extramural research funding becomes more intense, the provision of stipends for pre-candidacy doctoral students from research grants is expected to become problematic. Using grant funds to support students primarily involved in didactic coursework and preparation for candidacy examinations may create a potential short-term conflict between the educational needs of the student and research productivity needed for grant renewals.
7. Formula funding does not fully fund the cost of doctoral education, including stipends and benefits for pre-candidacy students, and trainee support from government sources has decreased in real dollars. This prevents programs at UT System institutions from becoming more competitive overall without additional state or institutional support.
8. There is a special need for fellowships and benefits to support doctoral students in the arts and humanities while they write their dissertations. After they have completed their own coursework and served as teaching or research assistants, they require a year or more to focus intensively on the preparation and writing of their dissertations, and there is a critical lack of funding for this purpose.
9. Faculty members, doctoral students, and postdoctoral fellows do not always have a clear sense of expectations and commitments from each other, from the program, or from the institution. This decreases student success rates, increases the time to complete the doctoral degree or postdoctoral study, and increases overall costs.
10. There is a shortage of students entering doctoral programs at UT System institutions in STEM fields and other critical areas to support strategic goals. Given the demographics of the state, this problem cannot be solved without increased diversity in graduate and postdoctoral programs and without major changes at the K-16 level.
11. There is a lack of financial, academic, and social support systems for capable but educationally disadvantaged students admitted to graduate school who are not sufficiently prepared for rigorous coursework and the conduct of independent research. Using the traditional method of supporting such students as research assistants funded by a faculty member's research grant is unrealistic and ultimately self-defeating; other mechanisms must be identified to support these students.
12. Graduate faculties do not always appreciate that traditional admissions criteria, especially standardized test scores, may not be reliable predictors of success as a graduate student and independent research scholar. In other cases, faculty may recognize this point but lack other reliable indicators to evaluate applicants from diverse backgrounds and/or with variable K-16 preparation.
13. Some programs may not have a critical mass of students, postdoctoral fellows, and faculty, and/or other essential resources (offices, meeting spaces, laboratories, etc.) to develop and maintain the interactive community of scholars necessary for creativity, innovation, and competitive programs.
14. Faculty members may not have the teaching, communications, lab management, and interpersonal skills to effectively operate programs in the contemporary atmosphere of increased diversity; varied backgrounds, interests, and aspirations; and changes in the number and type of career opportunities available for Ph.D. graduates. This lack of mentoring and management skills is counterproductive to creating a sense of community in which trainees feel included and valued.

C. Faculty and Educational Programs

1. Programs may not have a critical mass of research faculty capable of attracting enough students, obtaining sufficient funding, and being productive enough to operate a competitive program. Resources may be insufficient to recruit and retain sufficient numbers of competitive faculty members and/or to enable them to devote the required effort to doctoral and postdoctoral education for programs to be competitive.
2. Faculty may not feel they are adequately rewarded for contributions to doctoral and postdoctoral teaching, especially the oversight of dissertation and postdoctoral research. Whether real or perceived, this is highly problematic.
3. Adequate mechanisms may not always be in place to document and assess faculty members' contributions to doctoral and postdoctoral education. Assessments may not adequately include trainees and peers.
4. As noted previously, but also applicable here, faculty members, doctoral students, and postdoctoral fellows do not always have a clear sense of what each expects from the other, of the commitments each makes explicitly or implicitly to each other, or what the institutional/program expectations and commitments are for doctoral and postdoctoral education. There may be additional concerns at health institutions where some graduate faculty members may hold professional degrees and do not have extensive prior experience with academic doctoral education.
5. Faculty members may not have the teaching, advising, mentoring, communications, lab management, and interpersonal skills to effectively operate programs in the contemporary atmosphere of increased diversity of backgrounds, interests, and career aspirations; very large laboratories or research groups; multiple program affiliations and trans-disciplinary research; and teaching efforts.
6. A lack of faculty skills impacts the effectiveness of research training and didactic teaching and as noted in the previous section is also counterproductive to creating a sense of community in which trainees feel included and valued. Adequate mechanisms and/or sufficient time are not available to help faculty acquire needed skills.
7. New program proposals and ongoing reviews of existing ones can be insufficiently rigorous at institutional or System levels to ensure that competitive programs will develop and be maintained. Unrealistic assurances that "no new resources" are needed to initiate and/or to maintain quality programs are often made, along with assurances that other institutional programs such as undergraduate or professional education will not be adversely affected by diverting resources.
8. Institutions and faculty may have unrealistic expectations for developing doctoral and postdoctoral programs that are not aligned with their missions and resources or with institutional and System strategic plans. Proposed programs may overestimate their ability to attract productive research faculty and competitive doctoral and postdoctoral trainees.
9. Institutions do not provide adequate resources to stimulate creation of trans-disciplinary programs or mechanisms to adequately reward faculty participation (e.g., co-PI assignments on grants, credit for non-department teaching, etc.).
10. Some faculty members and department leaders are resistant to programmatic reorganizations that involve formation of trans-disciplinary programs and/or may lack the experience, knowledge, skills, and/or resources to develop such programs.
11. There is a critical lack of women and underrepresented minorities at senior faculty and leadership levels.
12. Institutions do not have mechanisms to recognize excellence in doctoral and postdoctoral education comparable to those for undergraduate and professional teaching and research achievements.
13. UT System and THECB do not have strategic plans that can assist programs to plan appropriate enrollments, ensure adequate resources are available, and guide institutional decisions to ensure that institutional, state, and national needs are met.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

D. Mentoring, Professional Socialization and Skills, and Career Development

1. Education does not always prepare students for critical thinking and problem solving necessary for creativity and innovation.
2. The career options for Ph.D.s are expanding dramatically, but the education provided by some programs is too narrowly focused and does not provide sufficient breadth for the range of careers available to trainees. Many faculty have worked exclusively in academia and do not have the first-hand experience to provide appropriate advice or mentoring about non-academic careers or to teach the skills required; some faculty members may not support, or may actually denigrate, trainees' desires to pursue non-academic careers.
3. Programs may not provide sufficient training in communications, organizational, and management skills or the breadth of knowledge needed to effectively participate in trans-disciplinary work or to function effectively in large, diverse teams.
4. Some faculty members do not understand the importance of mentoring and/or do not have the skills to effectively mentor trainees; institutions may not provide effective training for faculty who wish to improve their mentoring skills and/or encourage all faculty members to have such skills.
5. Mentoring and career development require effort for which faculty members do not have adequate time or may not feel adequately rewarded.
6. There may be real or perceived conflicts of interest between the trainees' needs for career development and mentoring and the advisors' needs for research productivity when trainees are funded from individual research grants.
7. Programs do not effectively survey alumni and their employers to assess how effectively education prepares graduates for their careers.
8. Institutions do not have the resources, or do not feel it is their responsibility, to help trainees assess their career interests and options and develop career plans.
9. Some faculty discourage trainees from taking the time to participate in available career development activities unrelated to their own research.
10. All trainees may not have access or training to utilize the tools that will help them identify, prepare for, and apply for independent positions. There is no coordinated mechanism for potential employers to identify and recruit UT System trainees for available positions.

A**PPENDIX 3**
Cost Estimates for Implementation of Recommendations

Undergraduate Summer Research Programs.

All UT institutions with research-based Ph.D. programs would be eligible to apply. The goal of the program is to provide an experience for undergraduates that will familiarize them with innovative research, provide basic research skills and training, and encourage them to consider subsequent Ph.D. study.

- UT System determines the number of positions available each year by discipline and solicits applications.
- Programs are 10 weeks and involve extensive interactions with doctoral and postdoctoral students.
- Applications may be submitted by individual academic departments or for interdepartmental, trans-disciplinary training.
- Applications must describe plans to recruit outstanding, diverse participants and conduct follow-up evaluations of attendees including enrollment in doctoral programs.
- Programs must provide a hands-on research experience; students should not merely observe research.
- Programs must provide training in communications skills and professional ethics and behavior and exposure to a broad range of career options.
- Funds could be used for student stipends, housing, and travel allowances.

Cost. We recommend that 500 positions be provided each year at a cost of $6,500 each. Awards would be for three years (contingent upon satisfactory progress) beginning with 160-170 positions in the inaugural year, and increasing by like amounts for each of the following two years. Awards would be eligible for competitive renewal every three years. The first-year cost would be approximately $1.1 million, and, after three years, the total annual cost would be $3.25 million. This is a very modest per student cost to encourage and support the most competitive college students from Texas and other states to pursue doctoral studies within the UT System.

Regents' Doctoral Fellowships

Each year the UT System would determine the number of fellowships to be made available in broad areas of doctoral education (e.g., biomedical sciences, physics, math, engineering; social sciences, arts, humanities, etc.) and issue a corresponding call for applications.

- Students would apply directly to UT System institutions.
- UT System institutions would submit the names of the most competitive students they admit to a review committee(s) appointed by the UT System that would evaluate the applications prior to the annual deadline for accepting offers of graduate school admission.
- Fellowships would provide $30,000 which would be used exclusively for doctoral student stipends. Institutions would pay costs of tuition, fees, and benefits. This stipend level would make these Regents' Fellowships highly competitive on a national level and the recognition of a "named award" would increase their attractiveness.
- Each award would be made for a total of four years contingent upon satisfactory progress and good academic standing.

Cost. We recommend that 200 four-year fellowships be awarded in the first year of the program with an additional 200 awards in years two, three, and four up to a total of 800 awards each year. Thereafter, 200 new awards would be made each year. The first-year cost of the program would be $6 million and would increase in four years to $24 million per year. While this cost is substantial it will insure that UT schools can compete successfully with the most outstanding universities to attract students from Texas, the US, and around the world; this in turn will have enormous dividends in increasing competitiveness for faculty recruitment and research productivity.

Postdoctoral Fellowship Support

The National Institutes of Health (NIH) level of support for a beginning postdoctoral scholar is $36,000 per year, and this is generally at or above national standards for many other fields including natural sciences and mathematics, social sciences, arts, and humanities. This basal stipend would be provided by the postdoctoral mentor or institution, and this UT System program would provide *additional* funds to give a competitive recruiting advantage to our institutions vs. other leading national and international universities.

- Each year the UT System would determine and publicize the number of awards to be made in broad areas of postdoctoral study.
- Mentors negotiating with prospective postdoctoral students would submit their names and credentials to a UT System committee that would review applications three to four times per year.
- Each award would provide a salary augmentation of $24,000 per year, for a total stipend of $60,000, which would be highly competitive on both national and international levels. Awards would be for two-year periods contingent upon performance.
- An additional amount of $12,000 would be provided for moving expenses and other reasonable relocation costs/personal or family expenses the first year, and to support professional development (e.g., attendance at professional meeting, research related expenses, computer and software, etc.) in the second year.

Cost. We recommend that 100 two-year awards be made the first year and a like number the second year and each subsequent year. First-year costs would be $3.6 million and $7.2 million each year thereafter. The sustained ability to recruit the most outstanding postdoctoral scholars, coupled with programs for undergraduates and doctoral students (*vide supra*) would have an enormous synergistic impact on UT System schools and elevate them to the most competitive level in the world for doctoral and postdoctoral education.

Centers of Excellence for Innovative, Trans-disciplinary Doctoral and Postdoctoral Training

To support the goal of increasing trans-disciplinary doctoral and postdoctoral education, we recommend the establishment of a program to support training in areas identified as high priority in the UT System strategic plan. For example, in the 2006-2015 plan these areas were cancer research, infectious diseases, and diabetes; drug diagnostics and development; security issues; energy; national labs, e.g., Sandia; information technology; and nanotechnology and nanoelectronics.

- Each year the UT System would announce high-priority areas and invite applications for innovative, trans-disciplinary doctoral and postdoctoral education programs; funding could also be requested for undergraduate summer research support to encourage undergraduates to enter doctoral programs in priority areas.
- Funds could be used for stipends, tuition, and benefits; trainee travel to professional meetings; other appropriate trainee-related expenses; and symposia or other mechanisms to raise awareness of the area in question.
- Initial awards would be for five years pending satisfactory performance, with a one-time option to submit a competitive continuation for no more than five additional years (i.e., a maximum of 10 years of support total).
- The intention of the program is the initial support for development and operation of doctoral and postdoctoral education programs in specific strategic areas that would become competitive for independent extramural support from non-university sources.

Cost. We recommend that two five-year awards ($ 0.5 million each) be made during the first year of the program for an initial annual cost of $1 million. Thereafter, two additional awards are recommended in years two through five, reaching a total of 10 awards that would be the level in all subsequent years. If each award was $ 0.5 million, this would represent a total annual cost of $ 5 million. These awards would be a cost effective ways to immediately elevate research competitiveness in the fields of greatest strategic importance to UT and to insure that our institutions educate the future leaders who will enable our universities to remain preeminent in the selected areas.

APPENDIX 4
Graduate and Postdoctoral Education in Texas and the UT System - Background, Current Programs, and Benchmarks

Background

Doctoral education in Texas and at UT System institutions has historically lagged behind that of other states and universities. For example, from 1920 – 1999, Texas ranked 6th in total Ph.D. production and produced less than one-half the Ph.D.s of New York and California and also trailed Illinois, Massachusetts, and Pennsylvania. During this time, The University of Texas at Austin ranked 12th in the nation in the number of doctorates awarded and 13th in awarding baccalaureate degrees to students who went on to receive a Ph.D.[11] As a result, Texas institutions, especially those that are younger than UT Austin, lag far behind those of other states in length of existence and total numbers of graduates which are key features in determining the national and international reputations that are critical to recruitment of faculty, graduate students, and postdoctoral fellows, as well as the potential for alumni support.

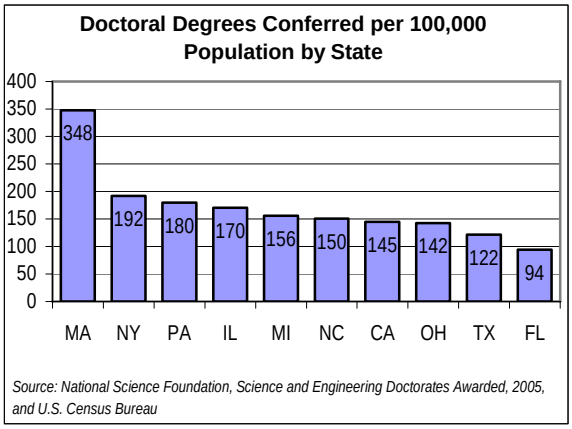
The Current Situation: Size and Scope of UT System Doctoral Programs

UT System institutions offer a large number of doctoral and postdoctoral programs in a wide range of fields. In 2005-06, UT System academic institutions enrolled 7,740 doctoral students in 187 doctoral programs on five campuses (UTA, UT Austin, UTD, UTEP, and UTSA). Five UT System health institutions (UTSWMC, UTMB, UTHSCH, UTMDA, and UTHSCSA) enrolled 1,901 students in large Ph.D. programs in the biomedical sciences that offer research specialization in a wide variety of areas. Collectively, these institutions awarded 1,231 doctoral degrees in 2004-05, which was over half the total awarded by all public universities and health-related institutions in the state. Data from the National Science Foundation indicates that these 10 institutions also have approximately 2,000 postdoctoral research scholars, although this figure is more difficult to interpret since the definition, classification, and tracking of postdoctoral scholars varies considerably among institutions and programs. Taken together, these figures indicate that UT System institutions devote a large amount of their efforts and resources to doctoral and postdoctoral education.

Texas is currently ranked 3rd in the nation in production of total Ph.D.s (behind California and New York), but Texas institutions awarded less than half the number of Ph.D.s as California in science and engineering fields. (NSF, June 2006) In 2005, Texas was 3rd overall in the total number of doctorates awarded, but the state continues to trail California, New York, and Massachusetts in awarding doctorates in the physical sciences; trails California in engineering doctorates by two-to-one (986 to 485); and is barely ahead of Massachusetts, Pennsylvania, and Illinois in science and engineering degrees awarded despite having a much larger college-aged population.[12] Thus, while the state and UT System institutions have made recent strides, we remain behind in several key areas.

- Texas ranks 30th of the 50 states in science and engineering Ph.D.s per 1,000 workers.[13]
- Texas ranks 8th out of the 10 most populous states in the proportion of science and engineering doctorates in the workforce.[14]
- Texas ranks 26th in R&D expenditures per capita. (14)
- In 2005, Texas was below the national average for Ph.D.s awarded per capita and ranked 9th out of the 10 most populous states in number of Ph.D.s awarded per 100,000 population.[15]

Together, all these indicators show that Texas significantly trails other key states with which we must compete in a number of critical parameters.



Diversity Must be Markedly Increased

Past and projected demographic shifts in Texas have had — and will continue to pose — significant challenges for doctoral and postdoctoral education in the state.

- In 2001, international students received roughly one-fourth of all doctorates awarded in Texas, yet changing regulations and restrictions since then have made graduate education in the U.S. less attractive to these students than that in Australia, Europe, and other locations. (9)
- African Americans and Hispanics receiving Ph.D.s in the state are highly underrepresented relative to their presence in the overall population of Texas, 5 percent vs. 11 percent and 7 percent vs. 34 percent respectively in 2001. (9)
- Similarly, as illustrated in the table below, African Americans and Hispanics are highly underrepresented relative to their presence in the overall population of Texas in the number of Ph.D.s awarded by all UT System institutions in 2004-2006.

	Doctoral Degrees Awarded by UT (All Institutions, 2004-06)	% of Total Doctoral Degrees Awarded by UT to Domestic Students	Percent in Texas population
White	1,673	75%	46%
African American	113	5%	12%
Hispanic	229	10%	38%
Asian	227	10%	
TOTAL Domestic	2,237		
Other" (assumed to be largely international)	1,424		
TOTAL Ph.D.s Awarded	3,361		
Sources: Texas Higher Education Coordinating Board and Texas State Data Center			

Given that the population of underrepresented minorities is increasing but the fraction of these ethnic groups who attend college and graduate school is less than that of Whites, current projections indicate that the absolute number of Ph.D.s awarded by UT System institutions and within the state will remain essentially constant within the next decade[16], and that by 2040 the proportion of the Texas labor force with a graduate or professional degrees will actually *decrease* by 17 percent.[17] This data underscores the critical need to increase the diversity of doctoral students and postdoctoral scholars from Texas and the U.S. in the UT System and to make our institutions more attractive to outstanding international applicants.

It should be noted that the University of Texas System has a special responsibility in meeting these challenges in Texas due to the nature of doctoral education in the state. In Texas, 85 percent of doctoral degrees are awarded by public institutions compared to the national average of 63 percent and that of the key states with which we must compete, e.g., California (48%), Pennsylvania (55%), Illinois (42%), and Florida (58%). In fact, of the 10 most populous states, only Michigan public universities provide as high a fraction of Ph.D.s awarded in the state as in Texas[9]. Consequently, unlike many other states, Texas cannot rely on private institutions to produce enough graduates to meet state needs — this falls largely to UT System institutions. It is a leadership role the System must embrace if the state is to prosper.

Health Benefits Must be Provided to Enhance Recruitment and Student Success

Every one of our discussions and focus groups with faculty members, administrative leaders, doctoral students, and postdoctoral scholars raised the issue of health benefits, perhaps the single most widely raised concern. There was unanimous and forceful agreement by all parties that health benefits must be provided to be competitive for recruiting doctoral students and postdoctoral scholars. The actions of the 78th Legislature, which imposed a 90-day waiting period and substantially diminished state funding for research and teaching assistantships, led to the loss or substantially reduced benefits for many students and created

a major financial burden for institutions that sought other fund sources to restore benefits. There was also unanimous agreement that providing health benefits comparable to those of faculty and staff would make UT System institutions highly competitive for recruiting doctoral students and postdoctoral scholars and is critical to increase diversity. In further support of this recommendation

- The UT System Student Advisory Council independently recommended that adequate health care benefits be provided for graduate students
- Best practices for postdoctoral programs listed by the National Academy of Sciences and other leading groups include providing adequate health benefits[4].
- Review of doctoral program websites at leading institutions with which UT System competes to recruit doctoral students and postdoctoral scholars indicate that all those examined provide health benefits; examples include Michigan, Wisconsin, Illinois, Harvard, Yale, Stanford, Duke, UC-San Francisco, UC-San Diego, Penn State, Washington University, Johns Hopkins, Baylor College of Medicine, Vanderbilt, and the Mayo Medical School.
- Provision of adequate health benefits for doctoral students and postdoctoral scholars and their dependents, as well as child care facilities, will enhance student success, and in many cases are absolutely essential to enable these students and scholars, who are older and more likely to have families than undergraduates, to participate in these advanced education programs.

Stipends are not Competitive at All UT System Institutions

Meaningful in-depth, comprehensive comparisons of doctoral student stipends are extremely difficult to obtain and interpret for a number of reasons.

- Stipends vary widely by disciplines, institutions, and geographic regions
- There are no uniformly accepted reporting standards or formats for stipends and benefits (e.g., 9 month vs. 12 month appointments)
- The stipends of doctoral students in the same discipline and institution vary substantial depending upon the nature of the support mechanism (e.g., teaching assistantship, research assistantship, competitive fellowship, individual award from an extramural foundation or government agency, training grant appointments, etc.)

School - Program	Stipend 2006-2007
Harvard Neurosciences	$28,008
Yale Biological and Biomedical Sciences	$28,000
U Penn Biomedical Graduate Studies	$26,520
UCSD Program in Biomedical Sciences	$26,000
UCSF Biomedical Sciences Program	$26,000
Duke Biochemistry	$25,000
UNC Biomedical Sciences	$23,000
Vanderbilt Interdisciplinary Graduate Program	$24,000
Mayo Graduate School	$23,600
Washington University in St. Louis Biology and Biomedical Sciences	$26,000
Baylor College of Medicine GSBS	$23,000
University of Michigan Program in Biomedical Sciences	$23,500
Stanford University Bioscience	$29,000
Johns Hopkins	$26,200
UT System Institutions	
UT Southwestern Graduate School of Biomedical Sciences	$23,000
UT HSC-Houston Graduate School of Biomedical Sciences	$23,000
UT Medical Branch Graduate School of Biomedical Sciences	$23,000
UT HSC-San Antonio Graduate School of Biomedical Sciences	$21,500
National Institutes of Health	$20,772
National Science Foundation	$22,500

Meaningful analysis of stipends for postdoctoral scholars is even more problematic. Some of the above points may apply, but in addition the length of experience of postdoctoral fellows since award of the Ph.D. varies substantially (typically from 0-4 years), and arrangements are almost always made between scholars and individual mentors rather than between individuals and academic departments as for doctoral students. Even in cases where institutions have recommendations, these are usually intended to serve as guidelines and in most cases specify either a minimum level and/or a very broad range.

The one area in which the Task Force has some degree of confidence in presenting actual data is for the biomedical science Ph.D. programs at UT System health-related institutions, since there are national

benchmarks (both NIH and NSF) for doctoral student stipends, there is a greater degree of consistency in reporting stipends for biomedical programs at different institutions, and substantial similarity in many cases to stipends in different sub-disciplines of the biomedical sciences (e.g., biochemistry, genetics, pharmacology, etc.). Thus we provide limited factual data in this area and simply relate our impressions for other areas from personal experiences and input from our focus group discussions with faculty, doctoral students, postdoctoral scholars, and administrative leaders.

At present the standard NIH stipends for doctoral students are $20,772 per year and NSF stipends are $22,500. These are the levels awarded for individual fellowships or appointment to training grants awarded by these agencies to institutions. The accompanying table indicates the stipends for doctoral students enrolled in biomedical sciences programs at UT System health-related institutions and also for a number of institutions with whom we compete. The UT System health-related institutions are above the NIH and NSF stipend levels and generally within the competitive range, albeit in the lower half and substantially below the levels of $28-29,000 at some of the most prominent East and West Coast institutions that offer the greatest competition for doctoral student recruitment. The Regent's fellowships of $30,000 recommended by the Task Force would provide stipends for selected areas in the most competitive range.

It is much more difficult to generalize the situation on academic campuses, but based upon the experience of the Task Force members and interviews with students, postdoctoral scholars, faculty, and administrative leaders several general points emerged about stipends for doctoral students.

- There is a wide disparity in stipends at the academic campuses, both between campuses and between different disciplines on the same campus
- Some programs at the larger campuses, especially in the sciences and engineering, are able to provide stipends within the competitive range, but not at the very top end or most competitive levels for their disciplines
- Many programs in the arts, humanities, and social sciences are not able offer competitive stipends for doctoral students. There is a special need for a final year of support for students in these areas to concentrate on completing the writing of their dissertations.
- Many of the newer doctoral programs at UT System institutions do not offer competitive stipends, this is especially problematic in cases where students must pay all or a portion of their tuition and health benefits

While these impressions are somewhat anecdotal and there may be exceptions, the general sense of the Task Force is that stipends at the academic campuses are not competitive in many disciplines, especially non-scientific ones, and that this limits the ability of these programs to recruit outstanding, diverse students.

In addition to the amount of stipends provided, the source of stipend funds is important to consider. For example, "fellowships" that do not carry any work obligations (e.g., teaching undergraduate classes) are seen as more desirable and prestigious than assistantships that carry some type of work obligation. The table below indicates the type and source of support for full time graduate students in science, engineering, and health at a number of leading public universities and the mean for the ten UT System institutions with Ph.D. programs.

9. U. T. System: Acceptance and approval of the final report from the Task Force on Doctoral Education and the Postdoctoral Experience and authorization to implement the recommendations held within the report (cont.)

Full-time graduate students in science, engineering, and health, by type and primary source of support: Fall 2004

Type and primary source of support	UT System	UC Berkeley	UCLA	UCSD	U Illinois	U Michigan	UWI-Madison	U Minnesota	Penn State	Ga Tech
All types and sources of support	10,105	5785	5130	2673	5118	5264	4703	5593	3922	4415
Fellowship and traineeship	855	1350	1257	670	497	1430	610	613	293	266
Federal support	447	503	474	336	84	440	402	242	145	111
Institutional support	316	837	742	233	405	912	106	247	126	24
Other nonfederal support	92	10	41	101	8	78	102	124	22	131
Research assistantship	3,158	1871	1182	1089	2202	1477	2201	1904	2044	2265
Federal support	1,333	1151	825	375	1403	874	1490	1010	1059	1050
Institutional support	1,107	714	248	489	711	490	356	535	685	699
Other nonfederal support	718	6	109	225	88	113	355	359	300	516
Teaching assistantship	2,256	1070	893	570	1228	878	803	1391	1006	687
Federal support	89	1	1	0	6	7	1	6	27	0
Institutional support	2,134	1069	892	570	1221	870	792	1370	967	650
Other nonfederal support	33	0	0	0	1	1	10	15	12	37
Other types of support	3,836	1494	1798	344	1191	1479	1089	1685	579	1197
Federal support	67	25	51	35	14	21	145	25	17	35
Institutional support	245	64	10	27	670	170	115	619	67	3
Other nonfederal support	190	158	20	28	2	65	71	109	45	50
Self support	3,334	1247	1717	254	505	1223	758	932	450	1109
Support type										
% Fellowships	8.5%	23.3%	24.5%	25.1%	9.7%	27.2%	13.0%	11.0%	7.5%	6.0%
% Research assistantship	31.3%	32.3%	23.0%	40.7%	43.0%	28.1%	46.8%	34.0%	52.1%	51.3%
% Teaching assistantship	22.3%	18.5%	17.4%	21.3%	24.0%	16.7%	17.1%	24.9%	25.7%	15.6%
% Other (excl. self)	5.0%	4.3%	1.6%	3.4%	13.4%	4.9%	7.0%	13.5%	3.3%	2.0%
Support source										
% Federal support	19.2%	29.0%	26.3%	27.9%	29.4%	25.5%	43.3%	22.9%	31.8%	27.1%
% Institution support	37.6%	46.4%	36.9%	49.3%	58.8%	46.4%	29.1%	49.5%	47.0%	31.2%
% Other nonfederal support	10.2%	3.0%	3.3%	13.2%	1.9%	4.9%	11.4%	10.9%	9.7%	16.6%
% Self support	33.0%	21.6%	33.5%	9.5%	9.9%	23.2%	16.1%	16.7%	11.5%	25.1%

Source: National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering

NOTE: These data must be interpreted with some caution because they represent all graduate students i.e., both master's and doctoral students while most other data in this appendix and report refers solely to doctoral students.

While there is wide variation among UT System institutions themselves, several important features emerge for the UT System take as a whole.

- The proportion of students at UT System institutions that are supported by fellowships (8.5%) is lower than at most of the other institutions listed.
- With only 19 percent of support coming from federal sources, on average, students at UT System institutions are less competitive than the other public institutions listed.
- Most of the other public institutions listed above offer more institutional support to graduate students than UT System institutions and require significantly less self-support from the student.

Overall this data indicates that the availability of additional fellowship and institutional support would significantly increase the competitiveness of UT System institutions for recruiting graduate students.

The Quality of Doctoral and Postdoctoral Education at UT System Institutions is not Appropriately Recognized

The Task Force repeatedly and consistently heard in discussions with faculty, doctoral students, postdoctoral scholars, and administrative leaders that the quality of UT System's doctoral and postdoctoral educational programs is not recognized at many undergraduate schools in the United States and other countries. This is a serious impediment to recruiting efforts that must be addressed by both the System and institutions for UT System's recruitment efforts to become more competitive.

In addition to comments from UT System institutions, there is some objective data to support this conclusion if one examines research grants and training grants in the area of biomedical sciences, which, as noted above, is an area where appropriate comparisons are relatively easier to make.

The table below provides the number and amount of research and training grants from NIH at a sampling of highly recognized universities and UT System health institutions. The ratio of training to research support is also provided, both by number and dollar amount.

Ratio of Training Grants to Research Grants at UT System Health Institutions

Institution	# Research Grants	# Training Grants	Ratio (as %)	$ Research Grants	$ Training Grants	Ratio (as %)
Harvard U	521	50	10%	$290,257,469	$20,578,321	7%
U Of Wisconsin Madison	564	43	8%	$225,606,046	$15,007,393	7%
U Of Chicago	392	27	7%	$175,246,011	$11,479,361	7%
Yale U	734	56	8%	$308,440,381	$20,052,204	7%
U Of California Berkeley	258	18	7%	$88,094,409	$6,145,291	7%
Stanford U	634	38	6%	$282,133,753	$17,474,508	6%
U Of Michigan	848	70	8%	$353,344,257	$21,476,156	6%
U Of Washington	849	63	7%	$408,269,801	$23,708,304	6%
Vanderbilt U	586	44	8%	$245,942,777	$14,270,403	6%
U Of North Carolina Chapel Hill	646	53	8%	$272,779,490	$14,986,608	5%
Johns Hopkins U	1,113	74	7%	$537,026,809	$28,654,743	5%
U Of Pennsylvania	1,000	71	7%	$433,269,557	$22,658,277	5%
Cornell U	434	28	6%	$170,845,920	$8,819,998	5%
U Of California San Diego	598	41	7%	$286,571,411	$14,452,160	5%
Massachusetts Institute Of Technology	217	13	6%	$162,233,177	$7,675,108	5%
Columbia U	670	45	7%	$307,420,522	$14,450,603	5%
U Of Minnesota	510	32	6%	$206,948,323	$9,208,627	4%
U Of California San Francisco	843	50	6%	$392,623,899	$17,236,067	4%
U Of Colorado Denver/Hsc Aurora	402	29	7%	$170,483,401	$6,928,140	4%
U Of California Los Angeles	782	49	6%	$360,017,579	$14,474,172	4%
Washington U	773	44	6%	$370,202,512	$14,613,581	4%
Baylor College Of Medicine	504	36	7%	$233,419,757	$9,016,045	4%
Duke U	685	40	6%	$351,399,865	$13,440,714	4%
Oregon Health & Science U	431	23	5%	$162,881,851	$5,935,780	4%
Case Western Reserve U	614	28	5%	$240,754,055	$8,427,194	4%
U Of Alabama At Birmingham	460	27	6%	$195,874,696	$6,013,011	3%
UT System Health Institutions						
UT Sw Med Ctr Dallas	374	18	5%	$159,122,228	$5,249,456	3%
UT Hlth Sci Ctr Houston	174	10	6%	$77,978,291	$2,199,451	3%
UT Hlth Sci Ctr San Ant	212	7	3%	$75,558,046	$2,025,288	3%
UT M D Anderson Can Ctr	314	8	3%	$147,074,507	$2,434,932	2%
UT Medical Br Galveston	225	9	4%	$98,883,348	$1,392,311	1%

Source: National Institutes of Health

Research grants from NIH provide an objective measure of the quality of faculty research based upon peer assessment. In contrast, training grants from the NIH are made to support the education of doctoral students and postdoctoral scholars in biomedical science and are assessed primarily on the basis of two criteria: the quality of the faculty research *plus* the quality and quantity of doctoral students and postdoctoral scholars that have previously applied to and accepted offers of admission to the department or program applying for the training grant. The second factor is an indicator of the external perception of the department's/program's quality.

By either number or dollar amount, UT System health institutions have a lower ratio of training grants to research grants, which suggests that the *perceived* quality or desirability of doctoral and postdoctoral education programs is not commensurate with the peer assessed quality of faculty research.

Another related parameter is the ratio of doctoral students enrolled for Ph.D. study in the basic science departments of medical schools to faculty members in the same departments. A higher ratio of graduate students to faculty often reflects the amount of funding available to support student stipends, either from external grants, state appropriations, or institutional funds. These data are collected annually by the Association of American Medical Colleges[18] for all U.S. medical schools. Data from 2005, the most recent year available, is provided below for the four UT System health institutions with medical schools.

The average number of graduate students per full time basic science faculty member at all schools is 2.22. The average for the ten schools with the highest ratio is 5.62, and the range of values for the top ten schools is 4.3 - 9.4. Out of 126 U.S. medical schools, the four UT System medical schools rank 59, 76, 77, and 116 despite the fact that the UT System health institutions generated over $1 billion dollars in research expenditures in the past fiscal year. UT System health institutions must increase the recognition of their doctoral training opportunities if they are to be nationally competitive.

	Graduate Student per Faculty Ratio	Rank (out of 126)
UT Southwestern Medical Center at Dallas	2.07	59
UT Medical Branch at Galveston	1.67	76
UT Health Science Center at Houston	0.83	116
UT Health Science Center at San Antonio	1.64	77
Average of 126 U.S. Medical Schools	2.22	
Average of top 10 U.S. Medical Schools (Range = 4.3 - 9.4)	5.62	

Source: Association of American Medical Colleges

Highly Competitive Institutions have Formal Offices with Assigned Responsibility for Postdoctoral Education

The National Postdoctoral Association provides a complete list of institutions that have already established a formal postdoc office (PDO). Inspection of their most current listing reveals the following private and public institutions have already established PDOs. These are the types of institutions that UT System institutions compete with for recruiting the most talented and capable postdoctoral scholars.

Private
California Institute of Technology
Columbia University
Harvard University
Johns Hopkins University
Massachusetts Institute of Technology
Princeton University
Rice University
Stanford University
Vanderbilt University

Public
University of California, Berkeley
University of California, San Francisco
University of California, Los Angeles
University of Michigan, Ann Arbor
University of North Carolina, Chapel Hill
University of Washington, Seattle
University of Wisconsin, Madison

Opportunities for External Funding of Major Trans-disciplinary Programs are increasing

The opportunities to obtain funding for trans-disciplinary research and education are increasing rapidly, and in discussions with faculty, doctoral students, postdoctoral scholars, and administrative leaders the Task Force consistently heard that UT System institutions must be competitive for this type of funding in the future. A search of the NIH website by keywords for "multi-investigator" and "interdisciplinary" Request for Applications (RFA) in biomedical sciences issued in 2006-07 revealed the following list, which is meant to be illustrative and not exhaustive.

Multi-investigator and Interdisciplinary Programs Funded by the NIH in 2006-07

Funding Source	Program Funding/year	Duration	Program
National Institute of Dental and Craniofacial Research	$10,000,000	7 years	Centers for Research to Reduce Disparities in Oral Health
National Institute of Mental Health and the National Human Genome Research Institute	$70,000,000	5 years	Centers for "drug" discovery in the Molecular Libraries Screening Network
National Institute of Diabetes and Digestive and Kidney Diseases	$2,000,000	5 years	Kidney Research Core Centers
National Institute of Environmental Health Sciences and National Institute of Aging	$750,000	5 years	Centers for Neurodegeneration Science
National Institutes of Health	$38,000,000	5 years	Clinical and Translation Science Centers
National Institute of Allergy and Infectious Diseases	$6,000,000	5 years	Networks for Pathogenesis Research in Women
The National Institute of Diabetes and Digestive and Kidney Diseases	$1,500,000	5 years	Obesity and Nutrition Research Centers
National Institute of Neurological Disorders and Stroke and the National Institute of Arthritis and Musculoskeletal and Skin Diseases	$1,000,000	varies	Translational research projects in muscular dystrophy
National Institute of Mental Health	$1,200,000	5 years	Formative Interdisciplinary Developmental Science Centers for Mental Health
National Institute of Mental Health	$3,000,000	5 years	Interdisciplinary Developmental Science Centers for Mental Health
National Human Genome Research Institute and National Institute of Mental Health	$20,000,000	5 years	Centers of Excellence in Genomic Science

Source: National Institutes of Health

UT System institutions must be positioned to be competitive for these types of awards which are becoming increasingly common in many areas of research and post baccalaureate research education.

APPENDIX 5
The K-12 Pipeline

Education in primary and secondary levels is extremely important to the future of graduate education because that foundation is critical to the success of students in college. Preparation in written and oral communication skills, reading comprehension, and basic quantitative thinking is important for students to succeed. Thus, it is imperative that all levels of education be aligned together in terms of standards, expectations, and agreements as to what students should be able to know by the end of each transition. This will require significant efforts to build seamless transitions from middle schools through graduate and post-graduate education.

Improving public education is everybody's responsibility. However, there are key players that should begin the conversations, and undergraduate education officials should lead the analysis of the problems that currently exist in this area, working with state policymakers and high schools to address what it means for students to be college ready. Graduate schools, graduate students, and postdoctoral fellows should be encouraged to participate voluntarily in ongoing and sustained efforts to improve K-12 education, such as providing enrichment and professional development opportunities for K-12 teachers, acting as role models or mentors to K-12 students, or working with policymakers to improve public education standards. Graduate schools could work with undergraduate and high school educators to develop recommended curricula to prepare students for success at all levels of education. They should take advantage of the work done or being done by professional societies.

The Task Force recommends that the UT System:

- Consider developing a central repository of information and resources to aid those individuals or programs who want to participate in this effort to improve public K-12 education; this would include information about available resources from professional societies and education groups, and identifying possible sources of support for interested individuals or programs.
- Focus their efforts to improve secondary education through already successful programs such the Institute for Public School Initiatives and on encouraging and supporting individual institutions to work with elementary, junior high, and high schools and community colleges in their campus regions
- Promote college readiness programs such as AVID, International Baccalaureate, and Advanced Placement as possible models for secondary education.
- Encourage and facilitate the development and dissemination of teacher professional development programs, particularly for science and mathematics, for middle and high school teachers.

These suggestions are in line with and reinforce recommendations from The National Academies[19] and The Academy of Medicine, Engineering, and Science of Texas.

APPENDIX 6
Acknowledgements

The UT System gratefully acknowledges the contributions of the Task Force members.

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TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT HEALTH RELATED INSTITUTIONS

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		9,480	11,235	1,755	18.5%		
	Undergraduate	2,126	1,925	-201	-9.5%	22.4%	17.1%
	Graduate	3,324	5,049	1,725	51.9%	35.1%	44.9%
	Professional	4,030	4,261	231	5.7%	42.5%	37.9%
	Male	3,934	4,480	546	13.9%	41.5%	39.9%
	Female	5,546	6,755	1,209	21.8%	58.5%	60.1%
	White	5,507	5,639	132	2.4%	58.1%	50.2%
	African-American	556	726	170	30.6%	5.9%	6.5%
	Hispanic	1,450	1,596	146	10.1%	15.3%	14.2%
	Asian-American	1,146	1,445	299	26.1%	12.1%	12.9%
	Native American	47	49	2	4.3%	0.5%	0.4%
	International	581	1,325	744	128.1%	6.1%	11.8%
	Unknown	193	455	262	135.8%	2.0%	4.0%
Undergraduate	Total	2,126	1,925	-201	-9.5%		
	Male	487	445	-42	-8.6%	22.9%	23.1%
	Female	1,639	1,480	-159	-9.7%	77.1%	76.9%
	White	1,178	923	-255	-21.6%	55.4%	47.9%
	African-American	208	176	-32	-15.4%	9.8%	9.1%
	Hispanic	494	393	-101	-20.4%	23.2%	20.4%
	Asian-American	140	261	121	86.4%	6.6%	13.6%
	Native American	11	10	-1	-9.1%	0.5%	0.5%
	International	25	76	51	204.0%	1.2%	3.9%
	Unknown	70	86	16	22.9%	3.3%	4.5%
Graduate	Total	3,324	5,049	1,725	51.9%		
	Male	1,229	1,856	627	51.0%	37.0%	36.8%
	Female	2,095	3,193	1,098	52.4%	63.0%	63.2%
	White	1,883	2,317	434	23.0%	56.6%	45.9%
	African-American	168	327	159	94.6%	5.1%	6.5%
	Hispanic	373	573	200	53.6%	11.2%	11.3%
	Asian-American	291	412	121	41.6%	8.8%	8.2%
	Native American	20	24	4	20.0%	0.6%	0.5%
	International	520	1,214	694	133.5%	15.6%	24.0%
	Unknown	69	182	113	163.8%	2.1%	3.6%
Professional	Total	4,030	4,261	231	5.7%		
	Male	2,218	2,179	-39	-1.8%	55.0%	51.1%
	Female	1,812	2,082	270	14.9%	45.0%	48.9%
	White	2,446	2,399	-47	-1.9%	60.7%	56.3%
	African-American	180	223	43	23.9%	4.5%	5.2%
	Hispanic	583	630	47	8.1%	14.5%	14.8%
	Asian-American	715	772	57	8.0%	17.7%	18.1%
	Native American	16	15	-1	-6.3%	0.4%	0.4%
	International	36	35	-1	-2.8%	0.9%	0.8%
	Unknown	54	187	133	246.3%	1.3%	4.4%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT SOUTHWESTERN

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		1,554	2,396	842	54.2%		
	Undergraduate	221	189	-32	-14.5%	14.2%	7.9%
	Graduate	520	1,282	762	146.5%	33.5%	53.5%
	Professional	813	925	112	13.8%	52.3%	38.6%
	Male	790	1,234	444	56.2%	50.8%	51.5%
	Female	764	1,162	398	52.1%	49.2%	48.5%
	White	872	993	121	13.9%	56.1%	41.4%
	African-American	79	101	22	27.8%	5.1%	4.2%
	Hispanic	130	209	79	60.8%	8.4%	8.7%
	Asian-American	281	390	109	38.8%	18.1%	16.3%
	Native American	7	10	3	42.9%	0.5%	0.4%
	International	122	576	454	372.1%	7.9%	24.0%
	Unknown	63	117	54	85.7%	4.1%	4.9%
Undergraduate	Total	221	189	-32	-14.5%		
	Male	63	80	17	27.0%	28.5%	42.3%
	Female	158	109	-49	-31.0%	71.5%	57.7%
	White	123	69	-54	-43.9%	55.7%	36.5%
	African-American	28	17	-11	-39.3%	12.7%	9.0%
	Hispanic	22	18	-4	-18.2%	10.0%	9.5%
	Asian-American	12	29	17	141.7%	5.4%	15.3%
	Native American	3	4	1	33.3%	1.4%	2.1%
	International	10	30	20	200.0%	4.5%	15.9%
	Unknown	23	22	-1	-4.3%	10.4%	11.6%
Graduate	Total	520	1,282	762	146.5%		
	Male	238	644	406	170.6%	45.8%	50.2%
	Female	282	638	356	126.2%	54.2%	49.8%
	White	317	489	172	54.3%	61.0%	38.1%
	African-American	7	28	21	300.0%	1.3%	2.2%
	Hispanic	26	70	44	169.2%	5.0%	5.5%
	Asian-American	40	111	71	177.5%	7.7%	8.7%
	Native American	3	4	1	33.3%	0.6%	0.3%
	International	106	535	429	404.7%	20.4%	41.7%
	Unknown	21	45	24	114.3%	4.0%	3.5%
Professional	Total	813	925	112	13.8%		
	Male	489	510	21	4.3%	60.1%	55.1%
	Female	324	415	91	28.1%	39.9%	44.9%
	White	432	435	3	0.7%	53.1%	47.0%
	African-American	44	56	12	27.3%	5.4%	6.1%
	Hispanic	82	121	39	47.6%	10.1%	13.1%
	Asian-American	229	250	21	9.2%	28.2%	27.0%
	Native American	1	2	1	100.0%	0.1%	0.2%
	International	6	11	5	83.3%	0.7%	1.2%
	Unknown	19	50	31	163.2%	2.3%	5.4%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT MEDICAL BRANCH GALVESTON

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		1,927	2,255	328	17.0%		
	Undergraduate	622	536	-86	-13.8%	32.3%	23.8%
	Graduate	482	858	376	78.0%	25.0%	38.0%
	Professional	823	861	38	4.6%	42.7%	38.2%
	Male	708	791	83	11.7%	36.7%	35.1%
	Female	1,219	1,464	245	20.1%	63.3%	64.9%
	White	1,100	1,265	165	15.0%	57.1%	56.1%
	African-American	167	210	43	25.7%	8.7%	9.3%
	Hispanic	302	280	-22	-7.3%	15.7%	12.4%
	Asian-American	225	289	64	28.4%	11.7%	12.8%
	Native American	11	7	-4	-36.4%	0.6%	0.3%
	International	80	103	23	28.8%	4.2%	4.6%
	Unknown	42	101	59	140.5%	2.2%	4.5%
Undergraduate	Total	622	536	-86	-13.8%		
	Male	98	117	19	19.4%	15.8%	21.8%
	Female	524	419	-105	-20.0%	84.2%	78.2%
	White	392	302	-90	-23.0%	63.0%	56.3%
	African-American	73	55	-18	-24.7%	11.7%	10.3%
	Hispanic	91	70	-21	-23.1%	14.6%	13.1%
	Asian-American	40	84	44	110.0%	6.4%	15.7%
	Native American	3	0	-3	-100.0%	0.5%	0.0%
	International	4	12	8	200.0%	0.6%	2.2%
	Unknown	19	13	-6	-31.6%	3.1%	2.4%
Graduate	Total	482	858	376	78.0%		
	Male	166	242	76	45.8%	34.4%	28.2%
	Female	316	616	300	94.9%	65.6%	71.8%
	White	304	523	219	72.0%	63.1%	61.0%
	African-American	17	76	59	347.1%	3.5%	8.9%
	Hispanic	45	76	31	68.9%	9.3%	8.9%
	Asian-American	31	51	20	64.5%	6.4%	5.9%
	Native American	5	2	-3	-60.0%	1.0%	0.2%
	International	74	87	13	17.6%	15.4%	10.1%
	Unknown	6	43	37	616.7%	1.2%	5.0%
Professional	Total	823	861	38	4.6%		
	Male	444	432	-12	-2.7%	53.9%	50.2%
	Female	379	429	50	13.2%	46.1%	49.8%
	White	404	440	36	8.9%	49.1%	51.1%
	African-American	77	79	2	2.6%	9.4%	9.2%
	Hispanic	166	134	-32	-19.3%	20.2%	15.6%
	Asian-American	154	154	0	0.0%	18.7%	17.9%
	Native American	3	5	2	66.7%	0.4%	0.6%
	International	2	4	2	100.0%	0.2%	0.5%
	Unknown	17	45	28	164.7%	2.1%	5.2%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT HEALTH SCIENCE CENTER HOUSTON

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		3,286	3,651	365	11.1%		
	Undergraduate	332	408	76	22.9%	10.1%	11.2%
	Graduate	1,785	2,024	239	13.4%	54.3%	55.4%
	Professional	1,169	1,219	50	4.3%	35.6%	33.4%
	Male	1,325	1,398	73	5.5%	40.3%	38.3%
	Female	1,961	2,253	292	14.9%	59.7%	61.7%
	White	1,948	1,910	-38	-2.0%	59.3%	52.3%
	African-American	210	254	44	21.0%	6.4%	7.0%
	Hispanic	380	447	67	17.6%	11.6%	12.2%
	Asian-American	430	471	41	9.5%	13.1%	12.9%
	Native American	17	21	4	23.5%	0.5%	0.6%
	International	276	477	201	72.8%	8.4%	13.1%
	Unknown	25	71	46	184.0%	0.8%	1.9%
Undergraduate	Total	332	408	76	22.9%		
	Male	33	52	19	57.6%	9.9%	12.7%
	Female	299	356	57	19.1%	90.1%	87.3%
	White	201	214	13	6.5%	60.5%	52.5%
	African-American	46	36	-10	-21.7%	13.9%	8.8%
	Hispanic	42	60	18	42.9%	12.7%	14.7%
	Asian-American	40	79	39	97.5%	12.0%	19.4%
	Native American	0	2	2		0.0%	0.5%
	International	3	15	12	400.0%	0.9%	3.7%
	Unknown	0	2	2		0.0%	0.5%
Graduate	Total	1,785	2,024	239	13.4%		
	Male	635	695	60	9.4%	35.6%	34.3%
	Female	1,150	1,329	179	15.6%	64.4%	65.7%
	White	964	910	-54	-5.6%	54.0%	45.0%
	African-American	125	176	51	40.8%	7.0%	8.7%
	Hispanic	213	232	19	8.9%	11.9%	11.5%
	Asian-American	202	207	5	2.5%	11.3%	10.2%
	Native American	11	14	3	27.3%	0.6%	0.7%
	International	252	449	197	78.2%	14.1%	22.2%
	Unknown	18	36	18	100.0%	1.0%	1.8%
Professional	Total	1,169	1,219	50	4.3%		
	Male	657	651	-6	-0.9%	56.2%	53.4%
	Female	512	568	56	10.9%	43.8%	46.6%
	White	783	786	3	0.4%	67.0%	64.5%
	African-American	39	42	3	7.7%	3.3%	3.4%
	Hispanic	125	155	30	24.0%	10.7%	12.7%
	Asian-American	188	185	-3	-1.6%	16.1%	15.2%
	Native American	6	5	-1	-16.7%	0.5%	0.4%
	International	21	13	-8	-38.1%	1.8%	1.1%
	Unknown	7	33	26	371.4%	0.6%	2.7%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT HEALTH SCIENCE CENTER SAN ANTONIO

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		2,665	2,825	160	6.0%		
	Undergraduate	903	684	-219	-24.3%	33.9%	24.2%
	Graduate	537	885	348	64.8%	20.2%	31.3%
	Professional	1,225	1,256	31	2.5%	46.0%	44.5%
	Male	1,093	1,016	-77	-7.0%	41.0%	36.0%
	Female	1,572	1,809	237	15.1%	59.0%	64.0%
	White	1,556	1,429	-127	-8.2%	58.4%	50.6%
	African-American	97	144	47	48.5%	3.6%	5.1%
	Hispanic	637	645	8	1.3%	23.9%	22.8%
	Asian-American	200	270	70	35.0%	7.5%	9.6%
	Native American	11	11	0	0.0%	0.4%	0.4%
	International	102	160	58	56.9%	3.8%	5.7%
	Unknown	62	166	104	167.7%	2.3%	5.9%
Undergraduate	Total	903	684	-219	-24.3%		
	Male	275	155	-120	-43.6%	30.5%	22.7%
	Female	628	529	-99	-15.8%	69.5%	77.3%
	White	431	296	-135	-31.3%	47.7%	43.3%
	African-American	58	51	-7	-12.1%	6.4%	7.5%
	Hispanic	338	230	-108	-32.0%	37.4%	33.6%
	Asian-American	38	44	6	15.8%	4.2%	6.4%
	Native American	4	4	0	0.0%	0.4%	0.6%
	International	7	10	3	42.9%	0.8%	1.5%
	Unknown	27	49	22	81.5%	3.0%	7.2%
Graduate	Total	537	885	348	64.8%		
	Male	190	275	85	44.7%	35.4%	31.1%
	Female	347	610	263	75.8%	64.6%	68.9%
	White	298	395	97	32.6%	55.5%	44.6%
	African-American	19	47	28	147.4%	3.5%	5.3%
	Hispanic	89	195	106	119.1%	16.6%	22.0%
	Asian-American	18	43	25	138.9%	3.4%	4.9%
	Native American	1	4	3	300.0%	0.2%	0.5%
	International	88	143	55	62.5%	16.4%	16.2%
	Unknown	24	58	34	141.7%	4.5%	6.6%
Professional	Total	1,225	1,256	31	2.5%		
	Male	628	586	-42	-6.7%	51.3%	46.7%
	Female	597	670	73	12.2%	48.7%	53.3%
	White	827	738	-89	-10.8%	67.5%	58.8%
	African-American	20	46	26	130.0%	1.6%	3.7%
	Hispanic	210	220	10	4.8%	17.1%	17.5%
	Asian-American	144	183	39	27.1%	11.8%	14.6%
	Native American	6	3	-3	-50.0%	0.5%	0.2%
	International	7	7	0	0.0%	0.6%	0.6%
	Unknown	11	59	48	436.4%	0.9%	4.7%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT M. D. ANDERSON CANCER CENTER

	Fall	2001	2006	# Change 2001-2006	% Change 2001-2006	% Distribution 2001	% Distribution 2006
Total Enrollment		48	108	60	125.0%		
	Undergraduate	48	108	60	125.0%	100.0%	100.0%
	Male	18	41	23	127.8%	37.5%	38.0%
	Female	30	67	37	123.3%	62.5%	62.0%
	White	31	42	11	35.5%	64.6%	38.9%
	African-American	3	17	14	466.7%	6.3%	15.7%
	Hispanic	1	15	14	1400.0%	2.1%	13.9%
	Asian-American	10	25	15	150.0%	20.8%	23.1%
	Native American	1	0	-1	-100.0%	2.1%	0.0%
	International	1	9	8	800.0%	2.1%	8.3%
	Unknown	1	0	-1	-100.0%	2.1%	0.0%

TOTAL FALL ENROLLMENT BY LEVEL, GENDER AND ETHNICITY
UT HEALTH RELATED INSTITUTIONS

	Fall 2001	Fall 2006	# Change Fall 2001 to Fall 2006	% Change Fall 2001 to Fall 2006
Total Enrollment	**9,480**	**11,235**	**1,755**	**18.5%**
Undergraduate	2,126	1,925	-201	-9.5%
Graduate	*3,324*	*5,049*	*1,725*	*51.9%*
Professional	4,030	4,261	231	5.7%
Male	3,934	4,480	546	13.9%
Female	*5,546*	*6,755*	*1,209*	*21.8%*
White	5,507	5,639	132	2.4%
African-American	556	726	170	30.6%
Hispanic	1,450	1,596	146	10.1%
Asian-American	1,146	1,445	299	26.1%
Native American	47	49	2	4.3%
International	*581*	*1,325*	*744*	*128.1%*
Unknown	*193*	*455*	*262*	*135.8%*

Prepared by Office of Health Affairs
October 2007

FALL ENROLLMENT CHANGES BY LEVEL, GENDER AND ETHNICITY
UT HEALTH RELATED INSTITUTIONS

	Fall 2001	Fall 2006	# Change Fall 2001 to Fall 2006	% Change Fall 2001 to Fall 2006	% Distribution	
Total Enrollment	**9,480**	**11,235**	**1,755**	**18.5%**		
Graduate Enrollment	**3,324**	**5,049**	**1,725**	**51.9%**		
Male	1,229	1,856	627	51.0%	37.0%	36.8%
Female	2,095	3,193	1,098	52.4%	63.0%	63.2%
White	1,883	2,317	434	23.0%	56.6%	45.9%
African-American	*168*	*327*	*159*	*94.6%*	*5.1%*	*6.5%*
Hispanic	*373*	*573*	*200*	*53.6%*	*11.2%*	*11.3%*
Asian American	291	412	121	41.6%	8.8%	8.2%
Native American	20	24	4	20.0%	0.6%	0.5%
International	*520*	*1,214*	*694*	*133.5%*	*15.6%*	*24.0%*
Unknown	69	182	113	163.8%	2.1%	3.6%

Prepared by Office of Health Affairs
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FALL ENROLLMENT CHANGES BY LEVEL, GENDER AND ETHNICITY
UT HEALTH RELATED INSTITUTIONS

	Fall 2001	Fall 2006	# Change Fall 2001 to Fall 2006	% Change Fall 2001 to Fall 2006	% Distribution	
Total Enrollment	**9,480**	**11,235**	**1,755**	**18.5%**		
Professional Enrollment	**4,030**	**4,261**	**231**	**5.7%**		
Male	2,218	2,179	-39	-1.8%	55.0%	51.1%
Female	*1,812*	*2,082*	*270*	*14.9%*	*45.0%*	*48.9%*
White	*2,446*	*2,399*	*-47*	*-1.9%*	*60.7%*	*56.3%*
African-American	*180*	*223*	*43*	*23.9%*	*4.5%*	*5.2%*
Hispanic	*583*	*630*	*47*	*8.1%*	*14.5%*	*14.8%*
Asian American	715	772	57	8.0%	17.7%	18.1%
Native American	16	15	-1	-6.3%	0.4%	0.4%
International	36	35	-1	-2.8%	0.9%	0.8%
Unknown	54	187	133	246.3%	1.3%	4.4%

Prepared of Office of Health Affairs
October 2007

FALL ENROLLMENT CHANGES BY LEVEL, GENDER AND ETHNICITY
UT HEALTH RELATED INSTITUTIONS

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Total Enrollment	**9,480**	**11,235**	**1,755**	**18.5%**		
Professional Enrollment	**4,030**	**4,261**	**231**	**5.7%**		
Medical Schoool Enrollment	**3,294**	**3,506**	**212**	**6.4%**		
Male	1,818	1,769	-49	-2.7%	55.2%	50.5%
Female	*1,476*	*1,737*	*261*	*17.7%*	*44.8%*	*49.5%*
White	*1,991*	*1,967*	*-24*	*-1.2%*	*60.4%*	*56.1%*
African-American	*162*	*198*	*36*	*22.2%*	*4.9%*	*5.6%*
Hispanic	*487*	*515*	*28*	*5.7%*	*14.8%*	*14.7%*
Asian American	589	643	54	9.2%	17.9%	18.3%
Native American	13	14	1	7.7%	0.4%	0.4%
International	9	16	7	77.8%	0.3%	0.5%
Unknown	43	153	110	255.8%	1.3%	4.4%

Prepared by Office of Health Affairs
October 2007

HISPANIC BUSINESS Magazine and HispanicBusiness.com
September 2007

Top 10 Best Medical Schools for Hispanics

1. The University of Texas Southwestern Medical Center at Dallas
The University of Texas Southwestern Medical School at Dallas
Dallas, Texas
www.utsouthwestern.edu/admissions

Total medical school enrollment...925
Hispanic enrollment...121
Percentage...13%
M.D. degrees earned...217
Degrees earned by Hispanics...21
Percentages...10%
Full-time faculty...1,821
Full-time Hispanic faculty...95
Percentage...5%

Diversity Statement: U. T. Southwestern Medical School achieves its dedication to diversity through one of its missions which emphasizes educating doctors who will practice in medically underserved areas of Texas.

2. Stanford University
School of Medicine
Stanford, California
www.med.stanford.edu

Total medical school enrollment...476
Hispanic enrollment...71
Percentage...15%
M.D. degrees earned...99
Degrees earned by Hispanics...14
Percentage...14%
Full-time faculty...751
Full-time Hispanic faculty...28
Percentage...4%

Diversity Statement: Stanford is committed to being a premier research-intensive medical school that improves health through leadership, collaborative discoveries, and innovation in patient care, education and research. In particular, we seek individuals whose leadership will result in significant advances in the ability to care for patients.

3. University of Miami

Leonard M. Miller School of Medicine
Miami, Florida
www.med.miami.edu

Total medical school enrollment...651
Hispanic enrollment...92
Percentage...14%
M.D. degrees earned...452
Degrees earned by Hispanics...15
Percentage...10%
Full-time faculty...1,168
Full-time Hispanic faculty...248
Percentage...21%

Diversity Statement: The University of Miami Miller School of Medicine actively recruits and strives to retain underrepresented minorities. More so, the Miller School sponsors motivational programs for high school and college students form underrepresented and disadvantaged backgrounds who are interested in pursuing careers in health care.

4. The University of Texas Medical Branch at Galveston

School of Medicine
Galveston, Texas
www.utmb.edu/somstudentaffairs

Total medical school enrollment...861
Hispanic enrollment...134
Percentage...16%
M.D. degrees earned...183
Degrees earned by Hispanics...30
Percentage...16%
Full-time faculty...849
Full-time Hispanic faculty...50
Percentage...6%

Diversity Statement: The first Hispanic medical student was enrolled at UTMB in 1917 and graduated in 1921. Since then, UTMB has graduated an impressive number of minority students. Over the last six years, of the 1,146 UTMB medical graduates, 18 percent were Hispanic, and 24 Hispanic students graduated in the Class of 2007.

5. The University of Texas Health Science Center at San Antonio
School of Medicine
San Antonio, Texas
www.som.uthscsa.edu

Total medical school enrollment...847
Hispanic enrollment...152
Percentage...18%
M.D. degrees earned...191
Degrees earned by Hispanics...34
Percentage...18%
Full-time faculty...603
Full-time Hispanic faculty...96
Percentage...16%

Diversity Statement: The School of Medicine bestowed more M.D. degrees to Hispanics in 2006 (34), than any other medical school in the country, according to the U.S. Department of Education. "This is a strong testimony to the environment this institution provides for Hispanic students and to its commitment for them," said Dr. Francisco G. Cigarroa, president of the Health Science Center.

6. University of New Mexico
School of Medicine
Albuquerque, New Mexico
www.hsc.unm.edu/som

Total medical school enrollment...329
Hispanic enrollment...90
Percentage...27%
M.D. degrees earned...65
Degrees earned by Hispanics...16
Percentage...25%
Full-time faculty...554
Full-time Hispanic faculty...40
Percentage...7%

Diversity Statement: The UNM School of Medicine is committed to maintaining its leadership position among Hispanic Serving Institutions through innovative programs such as the Combined BA/MD Degree Program, and the Health Careers Opportunity and Minority Women in Medicine Programs.

7. The University of Texas Health Science Center at Houston

The University of Texas Medical School at Houston
Houston, Texas
www.med.uth.tmc.edu

Total medical school enrollment...871
Hispanic enrollment...106
Percentage...12%
M.D. degrees earned...207
Degrees earned by Hispanics...30
Percentage...14%
Full-time faculty...776
Full-time Hispanic faculty...53
Percentage...7%

Diversity Statement: Demonstrating high quality education in a supportive environment, the diverse student body is 20 percent underrepresented minorities. Students actively participate in NNLAMS and community outreach such as the Houston Hispanic Forum.

8. Johns Hopkins University

School of Medicine
Baltimore, Maryland
www.hopkinsmedicine.org/som

Total medical school enrollment...482
Hispanic enrollment...27
Percentage...6%
M.D. degrees earned...118
Degrees earned by Hispanics...2
Percentage...2%
Full-time faculty...2,348
Full-time Hispanic faculty...63
Percentage...3%

Diversity Statement: The Johns Hopkins School of Medicine supports medical students via one-on-one mentoring, recruitment and retention of a diverse student body and sponsoring activities to increase diversity amongst medical students.

9. Florida State University

College of Medicine
Tallahassee, Florida
www.med.fsu.edu

Total medical school enrollment...284
Hispanic enrollment...34
Percentage...12%
M.D. degrees earned...36
Degrees earned by Hispanics...4
Percentage...11%
Full-time faculty...97
Full-time Hispanic faculty...8
Percentage...8%

Diversity Statement: Creating physicians to care for Florida's medically underserved is part of our mission. In a diverse state, that means recruiting students representative of the communities in which they will practice.

10. University of Illinois at Chicago

College of Medicine
Chicago, Illinois
www.medicine.uic.edu

Total medical school enrollment...1431
Hispanic enrollment...131
Percentage...9%
M.D. degrees earned...291
Degrees earned by Hispanics...30
Percentage...10%
Full-time faculty...1,090
Full-time Hispanic faculty...33
Percentage...3%

Diversity Statement: The Hispanic Center of Excellence at the University of Illinois at Chicago, College of Medicine has gained national recognition for its recruitment and graduation of underrepresented students in the medical profession. In 2006 due to the efforts of HCOE, UIC had the largest Latino incoming class in the country with 51 medical students of a total of 324. In 2006 UIC graduated the largest number of Hispanics at 30.

JOINT ADMISSION MEDICAL PROGRAM

A pipeline to Medical School for economically disadvantaged students

AUTHORITY

- Created by SB 940 of 77th Texas Legislature
- Administered by JAMP Council consisting of one faculty member from each medical school in the state

PURPOSE

- Support and encourage highly qualified economically disadvantaged students in preparing for and succeeding in Medical School

OPERATION

- Partnership between 8 medical schools, 31 public academic institutions and 34 private institutions to:
  1. Award scholarships for academic years and stipends for summer internships
  2. Mentor and advise students during undergraduate years
  3. Provide summer enrichment programs at medical schools (2 summers)
  4. Guarantee admission to a medical school if all requirements are met
- Medical schools must set aside up to 10% of entering class for JAMP participants (approx. 148 slots/year)
- 288 students admitted to program since April, 2003
- 130 students currently enrolled in undergraduate institutions
- 79 students currently enrolled in medical schools

FUNDING

- $4,000,000 State funds appropriated to THECB for Program – FY02-03
- $3,490,900 State funds appropriated to THECB for Program – FY04-05
- $3,316,355 State funds appropriated to THECB for Program – FY06-07
- $5,616,355 State funds appropriated to THECB for Program – FY08-09
- Use of funds
  1. Scholarships and stipends for participating students
  2. Enhance curriculum and educational opportunities for participating JAMP students at the public academic institutions
  3. Recruit students, mentor undergraduate students, provide summer internship programs and administer the program at the medical schools

BENEFITS OF PROGRAM

- Economically disadvantaged students receive scholarships and special mentoring to help prepare for medical school
- Undergraduate academic institutions receive funds to improve curriculum and develop programs to advise and mentor students (both JAMP participants and other students)
- JAMP students encouraged to return to home area to practice medicine

Joint Admission Medical Program

Joint Admission Medical Program

- **Pipeline to Medical School for economically disadvantaged students**
- **Partnership between the 8 Medical Schools in the state and 65 public and private undergraduate institutions to achieve a more diverse medical school pool**

Legislative History

Senate Bill 940 – 77th Texas Legislature

- **Created program to support & encourage highly qualified, economically disadvantaged students pursuing a medical education**
- **Administered by the JAMP Council**
- **Medical schools must set aside 10% of entering class for JAMP participants**
- **Funds to be appropriated by the Texas Legislature**

Senate Bill 1128 – 78th Texas Legislature

- **Created Alternate Pool**
- **Added Flexibility to program entry requirements**

Senate Bill 1247 - 79th Texas Legislature

- **Changed entry year into program from freshman to sophomore year**
- **Gave Council authority to re-allocate unfilled program openings during initial selection**
- **Established a pre-admission mentoring and assistance program during freshman year for prospective applicants**

Senate Bill 1601 – 80th Texas Legislature

- **Expanded participation of private or independent institutions**
- **Gives Community College students the opportunity to transfer to a four-year institution and be eligible to apply to the program**
- **Clarified scope of JAMP Council's ability to accept gifts and engage in fundraising**

Joint Admission Medical Program

Program Objectives

- **Select highly qualified, dedicated students through extensive selection process**
- **Provide undergraduate scholarships to participating students**
- **Provide summer internships at medical schools during undergraduate years**
- **Provide stipends for summer internships during undergraduate years**
- **Provide advising, mentoring and tutoring from undergraduate and medical schools throughout the year**
- **Provide guaranteed admission to a medical school if all requirements are met**
- **Provide scholarships and mentoring to participating students admitted to medical schools**
- **Provide funds to public undergraduate schools to enhance the quality of education**

Accomplishments

- **Selected four classes of JAMP students**
- **Successfully completed five summer internship programs**
  - **MCAT Review, Academic/Science Enrichment Component, Ethics, Clinical Experiences**
- **Created innovative mentoring programs at medical schools for undergraduate students**
- **Two classes entered medical schools**
- **Established online communication and message center to supplement mentoring efforts provided by medical schools**
- **Established a undergraduate JAMP Faculty Director (JFD) Consultant group to improve communication between all JFDs and the JAMP Council**

A Look to the Future

- **Create freshman year programs for prospective health professions students**
- **Develop a statewide online supplemental instruction program to support educational needs of JAMP and other health professions students**
- **Continue to seek funding through legislature and private sources to increase the number of participants to achieve the intent of the original legislation**
- **Increase the number of participating students to full ten percent of medical school entering classes**

Joint Admission Medical Program

Accomplishments

Selected Four Classes of JAMP Students

	1st Year	2nd Year	3rd Year	4th Year
# of Students Accepted	81	69	69	69

Characteristics

	1st Year	2nd Year	3rd Year	4th Year
Male	**31%**	**35%**	**33%**	**29%**
Female	**69%**	**65%**	**67%**	**71%**
# of Institutions with Participating Students	**30**	**36**	**30**	**31**
Public	**22**	**28**	**27**	**25**
Private/Independent	**8**	**8**	**3**	**6**

Students by Ethnicity

	1st Year	2nd Year	3rd Year	4th Year
African American	**12%**	**13%**	**9%**	**9%**
Hispanic	**35%**	**32%**	**38%**	**36%**
Asian Pacific Islander	**21%**	**20%**	**16%**	**22%**
Caucasian	**28%**	**29%**	**33%**	**32%**
All Others	**4%**	**6%**	**1%**	**1%**

Joint Admission Medical Program

Current Enrollment by Undergraduate Institution

Public Institutions

Angelo State University	1	Texas Woman's University	3
Lamar University	4	The University of Texas at Arlington	3
Midwestern State University	0	The University of Texas at Austin	16
Prairie View A&M University	2	The University of Texas at Brownsville	5
Sam Houston State University	2	The University of Texas at Dallas	8
Stephen F. Austin State University	2	The University of Texas at El Paso	2
Tarleton State University	2	The University of Texas at San Antonio	8
Texas A&M International University	1	The University of Texas at Tyler	1
Texas A&M University	18	The University of Texas of the Permian Basin	4
Texas A&M University – Corpus Christi	2	The University of Texas – Pan American	8
Texas A&M University – Galveston	1	University of Houston	11
Texas A&M University – Kingsville	3	University of Houston – Downtown	2
Texas Southern University	1	University of North Texas	4
Texas State University – San Marcos	1	West Texas A&M University	1
Texas Tech University	5		

Private Institutions

Baylor University	2	Southwestern University	1
Dallas Baptist University	1	University of Saint Thomas	1
Lubbock Christian University	2	Wiley College	1
Saint Mary's University	1		

Total of Current Undergraduate Participating Students = 130

Joint Admission Medical Program

Current Enrollment of JAMP students by Medical School

Baylor College of Medicine	7
Texas A&M University Health Science Center	5
Texas Tech Health Sciences Center	9
University of North Texas Health Science Center/Texas College of Osteopathic Medicine	9
University of Texas Southwestern Medical Center	13
University of Texas Medical Branch	12
University of Texas Health Science Center at Houston	12
University of Texas Health Science Center at San Antonio	12

Total of Current Medical School Participating Students = 79

Joint Admission Medical Program

Students Accepted into Medical School

	Entry Year 2006	2007
Baylor College of Medicine	3	4
Texas Tech Univ. Health Sciences Center	4	5
Texas A&M Univ. System Health Science Center	2	4
The University of North Texas Health Science Center /Texas College of Osteopathic Medicine	4	5
The Univ. of Texas Southwestern Medical Center at Dallas	7	7
The Univ. of Texas Medical Branch at Galveston	6	9
The Univ. of Texas Health Science Center at Houston	6	7
The Univ. of Texas Health Science Center at San Antonio	7	8
Total Accepted to Medical School	**39**	**49**

Students Accepted into Dental School

The University of Texas Health Science Center at San Antonio	1

Total Participants Accepted to a Professional School	**40***	**49***

* 79 Active JAMP students were accepted into Medical School
9 Former JAMP students were also accepted into Medical School (4 in 2006 & 5 in 2007)
1 Former student was admitted into Dental School in 2006

Undergraduate Universities

Abilene Christian University	1	Texas Christian University	1
Angelo State University	4	Texas State University – San Marcos	1
Austin College	1	Texas Tech University	3
Baylor University	1	Texas Woman's University	1
Hardin-Simmons University	1	The University of Texas – Pan American	2
Houston Baptist University	1	The University of Texas at Arlington	5
Lubbock Christian University	1	The University of Texas at Austin	15
Prairie View A&M University	1	The University of Texas at Dallas	3
Rice University	1	The University of Texas at El Paso	1
Saint Mary's University	1	The University of Texas at San Antonio	1
Southern Methodist University	1	The University of Texas at Tyler	2
Stephen F. Austin State University	1	The University of Texas of the Permian Basin	1
Tarleton State University	2	Trinity University	1
Texas A&M International University	3	University of Houston	8
Texas A&M University	12	University of Houston Downtown	1
Texas A&M University - Commerce	1	University of North Texas	4
Texas A&M University – Corpus Christi	1	University of Saint Thomas	1
Texas A&M University - Galveston	1	Wayland Baptist University	1
Texas A&M University – Kingsville	2		

Joint Admission Medical Program

Ethnicity of JAMP students accepted to Medical & Dental School