DOCTORAL EDUCATION IN TEXAS, PART 1: PAST TRENDS AND CRITICAL ISSUES

and

DOCTORAL EDUCATION IN TEXAS, PART 2: RECOMMENDATIONS FOR THE STATE

July 2004 – Part 1
October 2004 – Part 2

Texas Higher Education Coordinating Board

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Executive Summary

The purpose of this document, the first of a two-part report, is to examine doctoral education delivered at public universities and health-related institutions in Texas. The second part of the report, due in October, 2004, will provide recommendations for enhancing its effectiveness in closing the gaps in participation, success, excellence, and research. The study concerns itself strictly with “research doctorates,” including the Doctor of Philosophy (PhD) degree and “applied doctorates” such as the Doctor of Education (EdD) degree. The report does not include “professional” degree programs such as Doctor of Medicine and Doctor of Pharmacy degrees.

Section I: Characteristics of Doctoral Education

The Doctor of Philosophy (PhD) degree and its equivalents represent the highest level of academic study in the nation. It is a degree that indicates (or should indicate) that a graduate has mastered the advanced concepts of a field, is able to conduct scholarly research in the discipline, and can make independent intellectual contributions to the field. Characteristics of doctoral education include:

National Market. Compared to bachelor’s and master’s programs, doctoral programs often address a national market. Most institutions recruit nationally and internationally for doctoral students, and graduates often leave the region, state, and country for jobs.

Length of Doctoral Programs. Traditional doctoral programs can require as few as 60 semester credit hours (past the bachelor’s degree) or as many as 100 or more hours for some disciplines. Nationally, the average time to complete a doctoral degree (“enrolled time to degree”) is more than seven years beyond the bachelor’s degree.

Doctoral Faculty. Core faculty of doctoral programs are generally expected to engage in research activities, publish the results of that research, and serve as dissertation advisors to students. Because of these additional responsibilities, the classroom teaching load of doctoral faculty is usually less than faculty whose primarily responsibility is classroom teaching.

Student Financial Support. Many doctoral students receive a research or teaching assistantship, in which they work on faculty research projects or serve teaching functions such as leading discussion groups, supervising lab sections, or teaching courses. In addition to providing financial assistance, these positions provide students with career training and provide institutions with a source of inexpensive labor.

Section II: Demographic Trends in Doctoral Education – U.S. and Texas

Texas has mirrored the U.S. on the following trends in doctoral education:

- The number of doctoral degrees awarded in the U.S. peaked in 1998 at over 45,000 degrees, lowered, but is now rising. Texas peaked in 1996, awarding nearly 3,000 doctoral degrees.

- In 2001, U.S. and Texas institutions awarded more doctorates in science and math than in any other broad discipline. (24 and 25 percent, respectively)
• In Texas, the percent of doctoral degrees among all degrees awarded (baccalaureate and above) is close to the national average. (U.S.: 2.4 percent; Texas: 2.5 percent in 2001)

• The percent of doctoral degrees awarded to women has been increasing in the U.S. and Texas. (U.S.: from 37 percent in 1991 to 45 percent in 2001; Texas: from 36 to 44 percent)

• In 2001, significantly more females than males received doctoral degrees in the field of education in the U.S. and Texas. Significantly more males than females received doctoral degrees in the fields of science, math, and engineering.

• In the U.S. and Texas, international students receive about one-fourth of the doctoral degrees awarded. The percentage of Blacks and Hispanics receiving doctorates has risen only slightly from 1991 to 2001. (U.S.: Blacks 3 to 5 percent, Hispanics 2 to 3 percent; Texas: Blacks 3 to 4 percent, Hispanics 3 to 5 percent)

• In the U.S. and Texas, Blacks and Hispanics are proportionally underrepresented in doctoral education in relationship to their numbers in the population. (U.S: Blacks 12 percent in population versus 6 percent of doctoral degrees, Hispanics 13 versus 4 percent; Texas: Blacks 11 versus 5 percent, Hispanics 34 versus 7 percent in 2001 for non-international students)

• In 2001, doctoral degrees awarded to Blacks and Hispanics were concentrated in the field of education in the U.S. and especially in Texas. The percent of Hispanics and particularly Blacks receiving doctorates in the fields of science and math were lower than the percent of other groups receiving doctorates in these fields.

Texas differs from the U.S. on the following trends:

• In 2001, 85 percent of doctoral degrees awarded in Texas were from public institutions, as compared to the national average of 63 percent.

• In 2001, Texas awarded fewer doctoral degrees per 100,000 population than the U.S. average. (13 and 16 per 100,000 respectively)

Some facts and trends in doctoral education in Texas by region are as follows:

• In 2003, The University of Texas at Austin and Texas A&M University, both in Central Texas, account for more than one-half of the doctoral degrees awarded in the state.

• In 2003, doctoral degrees awarded per 100,000 population were the highest in Central Texas and the lowest in South Texas (of the regions producing doctoral degrees).

• The Central Texas and the Metroplex regions offer more doctoral programs than other regions of the state. Those regions and the Gulf Coast and South Texas regions have added more doctoral programs in the last ten years than other regions in the state.
Section III: Critical Issues Concerning Doctoral Education

Concerns and criticisms about doctoral education in Texas and the U.S. are numerous and significant.

Quality of Programs. National rankings of doctoral programs by *U.S News and World* and the National Research Council, among others, suggest that the quality of such programs can be measured somewhat precisely and then reflected in a rank-order list. However, many in the academic community question the validity of these rankings. One criticism of the rankings is that they rely, in part, on “reputational data” in which faculty peers (and administrators) provide quality judgments of other programs in their respective disciplines.

There are many quantifiable quality indicators of doctoral programs, such as number of faculty publications and grants per year, the percent of students who are full-time, graduation rates, time-to-degree of students, placement of graduates etc. Despite the availability of these quantitative indicators of quality, there is no definitive or singular methodology to evaluate doctoral programs. However, judging the quality and effectiveness of these programs remains an important responsibility. These judgments, even if imprecise, provide necessary information to policy makers and others in the state.

Differentiated Missions and Doctoral Education. Determining which institutions should have doctoral programs and in which disciplines is a challenge for Texas and other states. California addresses this issue through its Master Plan for Higher Education. Adopted in 1960, the plan assigns each of three public segments of higher education its own distinctive mission. The nine University of California (UC) campuses are the state’s primary academic research institutions, while the 23 California State University (CSU) campuses provide education through the master’s degree. The UC campuses have exclusive authority for doctoral education with some limited exceptions in which CSU institutions can offer joint doctoral programs with other UC or independent institutions. While not without criticism, the California Master Plan has been praised as a rational, coherent system that encourages different types of institutions to reach excellence within their own particular mission.

Without such a clean differentiation of institutional functions for Texas public higher education, individual institutions (and their board of regents) in the state have more “mission autonomy” and opportunities for change. While this flexibility can be a positive characteristic of a higher education system, a coordinated statewide vision is advisable to guide growth in the number of new degree programs, especially doctoral programs.

Growth of doctoral programs is sometimes measured under the rubric of the Carnegie Classification system, which groups higher education institutions together, based on “institutional functions” as indicated by level of degrees awarded and the number of disciplines in which they are awarded. Carnegie has two classifications for doctoral-granting institutions, and Texas has six institutions in each of the two categories. As Texas institutions add doctoral programs (and there have been significant increases in new doctoral programs in the last two years), their Carnegie classification could change; however, the Carnegie Foundation believes that institutional growth and change just for the sake of Carnegie mobility is not a commendable educational goal.
Attrition and Time-to-Degree. Two common criticisms of doctoral programs are that not enough students finish them and those that do finish take too long. Nationwide, attrition rates of doctoral programs appear to be 40 to 50 percent. Most studies suggest that students leave not so much for academic reasons but because of either financial reasons or a lack of significant involvement in the department or program. Students holding either research or teaching assistantships are advantaged, as these positions help to address both issues. Given the significant financial investment by institutions, by states, and by the U.S. government in doctoral education and the considerable personal investment by students, all parties must increase efforts to improve the completion rates of doctoral students.

The national median “registered time-to-degree” (the total time a student is enrolled in a doctoral program from after completion of a baccalaureate degree to the receipt of the doctoral degree) was 7.6 years in 2002. This figure has been steadily rising over the last 30 years. Some factors affecting time-to-degree include adequate financial support, effective faculty mentoring, percent of part-time students, and the actual degree requirements. Institutional desires to ensure both breadth and depth of disciplinary competence for students result in additional hours in the curriculum. Higher education officials should continually evaluate doctoral degree requirements to balance their benefits against maintaining a reasonable time-to-degree for students.

Specialization of Doctoral Education: Depth versus Breadth. The struggle between depth and breadth in doctoral education is an important one. Curricular and research depth bring potential benefits to the students who can become and claim to be experts in a particular area. However, potential employers in industry, government, and even academia also want graduates with “transportable skills” that can be applied in varied circumstances. Such workforce requirements call for a broader curricular approach to doctoral education and for more opportunities for doctoral students to work collaboratively with others in and out of their field.

Diversity in Doctoral Education. Many concerns have been raised that the high participation of international students in doctoral education crowds out American students and makes it more difficult for U.S. graduates to get jobs. However, many suggest that efforts to limit the presence of international students in U.S. doctoral education are unwarranted. Some of the strongest students in doctoral programs in the U.S. are international students, who therefore enhance the intellectual (and cultural) climate of doctoral programs. In addition, the international students that stay in the U.S. after graduation are assets to their employer, and those that leave the U.S strengthen the workforce of their native countries. These students can also take back with them a better understanding of U.S. culture.

The concern about the under-representation of Black and Hispanic students is a valid one. Because of the under-representation of these groups in doctoral education, they are also underrepresented in fields that require doctoral degrees, such as in academia. The nation’s universities have a major responsibility to work with both K-12 and undergraduate institutions to encourage Black and Hispanic students to prepare for and complete doctoral education in a broad variety of fields – especially science, math, and engineering.

Workforce Needs. Surveys show that less than half of doctoral graduates eventually work as tenure-track faculty at universities and health-related institutions. Employment opportunities and student interest in these positions vary considerably by discipline, but since interest in faculty jobs exceed available positions in nearly all disciplines, one can conclude that supply exceeds demand with respect to academia. (Nursing is a notable exception.) Some
doctoral graduates who do not receive tenure-track positions accept non-tenure positions, but these positions are generally not as desirable for those seeking full-time permanent work.

Hopes for an increased demand for faculty positions rest in large part on expectations of significant faculty retirements in the next few years. Nearly a third of the full-time faculty in the U.S. are 55 years of age or older, but it is difficult to predict precisely the retirement patterns of these faculty. Even with a substantial amount of faculty turnover, cost constraints could continue to affect the number of tenure-track positions in higher education. There are, however, attractive career choices for doctoral graduates in business, government, health-related facilities, and non-profit organizations. Many higher education stakeholders feel that universities and health-related institutions should promote non-academic positions as having an equal status as faculty positions and should devise doctoral programs that prepare students equally for careers inside and outside of academia.

Regional Needs versus State and National Needs. Doctoral education inherently has much more of a national scope than most baccalaureate and master's programs. The job market for doctorally-trained graduates can be limited, and applicants must often extend job searches well beyond a particular region to obtain employment. This is particularly true for jobs in academia; as a general rule, institutions do not hire their own graduates for tenure-track faculty positions. While governmental agencies and businesses hire doctoral graduates from local universities, there are a limited number of positions that demand doctoral-level expertise. Institutions must also look outside the region when recruiting doctoral students, as the local student pool can diminish over time. Most in academia agree that it is healthy and desirable that doctoral programs have a national and international focus. Universities and health-related institutions generally do not hire their own doctoral graduates, so that new faculty from different educational environments bring different ideas and fresh perspectives to apply to their respective disciplines. It is also desirable to draw students into doctoral programs from different undergraduate universities, from different parts of the state and nation, and from different countries. Such diversity enriches the doctoral experience for all.

Texas follows those patterns, as just 47 percent of the doctoral enrollment at the state's public universities and health-related institutions (in fall of 2003) were Texas residents compared to 93 percent in baccalaureate education. Texas institutions also draw most of their faculty from outside the state, as only about one-fourth of doctorally prepared faculty at Texas institutions received their degrees from Texas public universities and health-related institutions. The University of Texas at Austin and Texas A&M University together produced over half of these faculty.

Section IV: Costs and Benefits of Doctoral Education

Doctoral education is expensive, with costs to students, institutions, and state that exceed baccalaureate- and master's-level education. Nationally, doctoral graduates take an average of 7.6 years (beyond a bachelor’s degree) to complete their doctorates. In Texas, if no financial aid or tuition benefits were provided, that would result in an average of $20,500 for tuition and fees. Living costs and foregone wages add to the picture.
New doctoral programs are expensive for institutions and for the state. Texas programs started within the last five years had new five-year costs of over $2 million on average, with those in science and engineering programs costing up to $6 million. At the state level, doctoral students account for 2.1 percent of the total semester credit hours generated, but they garner for their institutions 12.4 percent of all formula-driven instruction and operation funds. Doctoral education has disproportionately higher costs (and formula income) because of expensive equipment, laboratories, and library resources; higher faculty to student ratios; and higher faculty salaries. This translates into average costs of $44,019 per doctoral full-time student-equivalent (FTSE) versus $18,024 for a master’s FTSE or $8,430 for bachelor’s FTSE.

Yet, doctoral education yields many benefits. For the graduate, higher salaries and lifetime earnings, less risk of unemployment, and greater opportunities for rewarding, intellectually challenging work. For institutions, greater likelihood of generating external research funding, enhanced abilities to attract research-focused faculty, enhanced intellectual resources and opportunities, and perceived prestige. For the state and society, economic leveraging of the research funds that come into the state (over $1.2 billion in 2003); the cultural, scientific, health, and economic advances that emerge from doctoral faculty and their students; and the preparation of faculty that will educate future generations in our schools, colleges and universities.
Introduction

Doctoral students account for only 1.8 percent (18,325 students) of all students in public higher education in Texas, yet these students generate 7.4 percent ($201,209,000) of all formula funding provided by the state (in 2003). As a product of that investment, doctoral education addresses critical needs for Texas and the nation. Science and engineering graduates make significant advanced research and development contributions for industry, government, universities, and health-related institutions. Graduates in humanities, social sciences, and the arts enhance our understanding of human thought and the human condition. And graduates in every discipline serve as faculty in all sectors of higher education.

The purpose of this document, the first of a two-part report, is to examine doctoral education delivered at public universities and health-related institutions in Texas. Section I of the report describes the characteristics of doctoral education and distinguishes it from other kinds of post-baccalaureate degree programs. Section II reviews past trends in doctoral education in Texas and the U.S. and includes demographic data on degree production and other measures. Section III examines critical issues and concerns about doctoral education, including program quality, institutional aspirations for doctoral programs, lack of diversity of doctoral students, workforce needs, and overproduction of graduates. This first part of the report concludes with Section IV, which identifies some of the costs and benefits of doctoral education to the state, to institutions, and to students.

The second part of this study, which will be presented at the October 2004 Board meeting, will examine the strengths and concerns of doctoral education specific to Texas and will provide recommendations for enhancing its effectiveness in closing the gaps in participation, success, excellence, and research.
Section I: Characteristics of Doctoral Education

The Doctor of Philosophy (PhD) degree and its equivalents represent the highest level of academic study in the nation. It is a degree that indicates (or should indicate) that a graduate has mastered the advanced concepts of a field, is able to conduct scholarly research in the discipline, and can make independent intellectual contributions to the field.

Requirements of Doctoral Programs. While requirements for doctoral students vary considerably from institution to institution and discipline to discipline, there are some basic components of doctoral education that are common to most all programs. Doctoral students are required to:

1. complete a significant amount of graduate coursework;
2. pass “comprehensive” or “qualifying” exams which certify the student’s knowledge of “core” competencies and his or her ability to continue doctoral work;
3. develop a specific area of interest within the discipline; and
4. complete a dissertation under the supervision of a faculty advisor in which the student:
   a. designs and conducts original research;
   b. writes the results of the research; and
   c. presents (“defends”) the study before his or her dissertation committee.

This model for doctoral study has largely endured for the 100-year history of doctoral education in the U.S.

Distinctions from other Post-Baccalaureate Degrees. This report concerns itself strictly with “non-professional” doctorates. Professional degree programs, such as Doctor of Medicine, Doctor of Jurisprudence (law), Doctor of Pharmacy, and others provide training needed for the practice of these professions; they are not included in this study. Master’s programs, while sharing some characteristics of doctoral study, are also largely “practitioner” oriented and do not represent the scholarship and research level or focus of a doctoral degree.

Applied Doctorates. The PhD is, by far, the most common doctoral degree awarded in the U.S. and Texas. However, other doctoral degrees are awarded, primarily in applied fields such as education (Doctor of Education or EdD degree). Like the PhD, these “applied” doctorates are research degrees with requirements largely similar to PhD programs. The research activities of these programs are generally in practitioner settings and are often designed to solve specific problems. Further, the dissertation studies of students in applied doctoral programs may not rise to the same threshold of “creating new knowledge” as PhD dissertations are supposed to do. However, these programs are research doctorates, and the National Science Foundation recognizes these degrees as equivalent to the PhD. Applied doctorates are, therefore, included in this study. At Texas public higher education institutions, applied doctorates are offered in education (EdD), engineering (Doctor of Engineering or DENG), music (Doctor of Musical Arts or DMA), public health (Doctor of Public Health or DrPH), nursing (Doctor of Science in Nursing or DSN), and physical therapy (Doctor of Science in Physical Therapy or DScPT).
Compared to bachelor’s and master’s programs, doctoral programs often address a national market. Most institutions recruit nationally and internationally for doctoral students, and graduates often leave the region, state, and country for jobs. (See Section III G)

Entry and Length of Doctoral Programs. Some doctoral programs require a student to have an earned master’s degree in a specified discipline to enter the program; other programs allow a student to enter after the completion of a bachelor’s, master’s, or professional degree. Traditional doctoral programs can require as few as 60 semester credit hours (past the bachelor’s degree) or as many as 100 or more hours, particularly for programs such as Clinical Psychology which include many hours of clinical work. Nationally, the average time to complete a doctoral degree (“enrolled time to degree”) is more than seven years beyond the bachelor’s degree. (See Section III C)

Doctoral Faculty. Core faculty of doctoral programs are generally expected to engage in research activities (which bring external funding to the institution), publish the results of that research in peer-reviewed journals or monographs, and serve as dissertation advisors to students. Because of these additional responsibilities, the classroom teaching load of doctoral faculty is usually less than faculty whose primarily responsibility is classroom teaching.

Student Financial Support. Almost all institutions provide financial support for some of their doctoral students. Nationally, approximately half of all doctoral students receive a research or teaching assistantship, in which they work on faculty research projects or serve teaching functions such as leading discussion groups, supervising lab sections, or teaching courses. In addition to providing financial assistance, these positions (usually 20 hours per week) provide students with career training and provide institutions with a source of inexpensive labor (See Section III C and Section IV).

These are some characteristics of doctoral education that distinguish it from other types of degree programs in higher education.
Section II: Demographic Trends in Doctoral Education – U.S. and Texas

A. Degrees Awarded

The number of doctoral degrees awarded in the U.S. peaked in 1998, but is rising again.

Doctoral degrees awarded in Texas largely follow the national trend, but the number peaked in 1996.
B. Degrees by Discipline

The distribution of doctorates awarded by discipline in the U.S. and Texas is very similar. Institutions awarded more science and math doctorates than any other discipline. (Note that several of the following charts rely on 2001 data – the latest available. Staff believes that data for the years shortly preceding and following 2001 would be similar.)

Doctoral Degrees Awarded by U.S. Institutions by Discipline, 2001
Total Number of Doctoral Degrees: 44,904

Doctoral Degrees Awarded by Texas Public & Independent Institutions (Universities and Health-Related Institutions) by Discipline, 2001
Total Number of Doctoral Degrees: 2,752

Source: U.S. Dept. of Education, National Center for Educational Statistics, Integrated Postsecondary Education Data System (IPEDS), "Completions" surveys as reported on the National Science Foundation's (NSF) WebCASPAR system.

THECB 7/2004

Source: IPEDS on NSF's WebCASPAR

THECB 6/2004
C. Degrees by Type of Institution (Public vs. Independent)

Texas ranks second, after Michigan, in the percentage of doctoral degrees awarded by public institutions (as compared to those awarded by independent institutions) among the 10 most populous states.

Doctoral Degrees Awarded by Type of Institution (Public/Independent) in U.S. and Ten Most Populous States in 2001

Source: IPEDS on NSF’s WebCASPAR THECB 7/2004
D. Degrees per Population

Texas awards fewer doctoral degrees per 100,000 population than the U.S. average and most of the 10 most populous states.

Sources: US DOE: IPEDS for NSF’s WebCASPAR, US Census Bureau
E. Percent of Doctorates Awarded

In Texas, the proportion of doctoral degrees among all degrees awarded (baccalaureate and above) is close to the national average and to many of the 10 most populous states.

*DOCTORAL DEGREES AWARDED AS A PERCENTAGE OF TOTAL DEGREES AWARDED* AT PUBLIC AND INDEPENDENT INSTITUTIONS IN US AND TEN MOST POPULOUS STATES, 2001

<table>
<thead>
<tr>
<th>State</th>
<th>Doctoral Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>2.4%</td>
</tr>
<tr>
<td>California</td>
<td>3.2%</td>
</tr>
<tr>
<td>Florida</td>
<td>2.7%</td>
</tr>
<tr>
<td>Georgia</td>
<td>2.6%</td>
</tr>
<tr>
<td>Illinois</td>
<td>3.0%</td>
</tr>
<tr>
<td>Michigan</td>
<td>2.0%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>2.7%</td>
</tr>
<tr>
<td>New York</td>
<td>2.3%</td>
</tr>
<tr>
<td>Ohio</td>
<td>2.7%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>2.4%</td>
</tr>
<tr>
<td>Texas</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

*Total degrees awarded at the baccalaureate through first professional levels

Source: US DOE: IPEDS on NSF WebCASPAR
F. Degrees by Gender

The percent of doctoral degrees awarded to women has been increasing in the U.S. and Texas.
Significantly more females than males receive doctoral degrees in the field of education in the U.S. and Texas. Significantly more males than females receive doctoral degrees in the fields of science, math, and engineering in the U.S. and Texas.

Doctoral Degrees Awarded by U.S. Institutions by Gender and Discipline in 2001: 44,904 Degrees

Doctoral Degrees Awarded by Texas Public and Independent Institutions by Gender and Discipline in 2001: 2,752 Degrees

G. Degrees by Ethnicity

In Texas and the U.S., international students receive about one-fourth of the doctoral degrees awarded. The percentage of Blacks and Hispanics receiving doctorates has increased only slightly since 1991.
Blacks and Hispanics are underrepresented among recipients of doctoral degrees awarded by U.S. institutions to U.S. citizens. The same is true for Texas institutions and the Texas population.

**Comparison of U.S. Population and Doctoral Degrees Awarded to U.S. Citizens by U.S. Institutions by Ethnicity in 2001**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>76%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13%</td>
</tr>
<tr>
<td>Black</td>
<td>12%</td>
</tr>
<tr>
<td>Asian, Other</td>
<td>6%</td>
</tr>
</tbody>
</table>

Sources: IPEDS on NSF's WebCASPAR, U.S. Census Bureau
Comparison of Texas Population and Doctoral Degrees Awarded to Non-International Students by Texas Public and Independent Institutions by Ethnicity in 2001

Sources: IPEDS on NSF's WebCASPAR, U.S. Census Bureau THECB 7/2004
Doctoral degrees awarded to Blacks and Hispanics are concentrated in the field of education in the U.S., and even more in Texas. The percent of Hispanics and particularly Blacks receiving doctorates in the fields of science and math were lower than the percent of other groups receiving doctorates in these fields.

Doctoral Degrees Awarded by U.S. Institutions by Ethnicity and Discipline in 2001: 44,904 Degrees

Source: IPEDS on WebCASPAR
Doctoral Degrees Awarded by Texas Public and Independent Institutions by Ethnicity and Discipline in 2001: 2,752 Degrees

White: 1,590

Hispanic: 134

Black: 101

Asian & Other: 231

International: 696

H. Degrees, Discipline Areas, and Programs by Region in Texas

The University of Texas at Austin and Texas A&M University, both in Central Texas, account for more than one-half of the doctoral degrees awarded in the state.

Doctoral Degrees Awarded by Texas Public Institutions in FY 2003 and Number of Institutions with Doctoral Authority by Region

*Includes degrees awarded by TAMUHSC’s Baylor College of Dentistry

Source: THECB
Doctoral degrees awarded per 100,000 population are the highest in Central Texas and the lowest in South Texas (of the regions with institutions that award doctoral degrees).

Doctoral Degrees Awarded by Texas Public Institutions per 100,000 Population by Region FY 2003

*Includes degrees awarded by TAMUSHSC’s Baylor College of Dentistry

Source: THECB
The Central Texas, Metroplex, and Gulf Coast regions offer doctoral degrees in more discipline areas (e.g. Education, Psychology) than other regions of the state.

Doctoral Discipline Areas* at Texas Public Institutions by Region

Programs counted in the region of the parent institution's main campus.
*Discipline areas refer to the 2-digit CIP code such as Engineering and Psychology (as opposed to the 8-digit CIP codes which break down disciplines into more specific areas such as Chemical Engineering and Civil Engineering and Clinical Psychology and Cognitive Psychology) Source: THECB

THECB, 7/2004
The Central Texas and Metroplex regions offer more doctoral programs than other regions of the state.

**Doctoral Programs* at Texas Public Institutions by Region**

Programs counted in the region of the parent institution’s main campus.  
*Programs refer to the 8-digit CIP code such as Chemical Engineering and Civil Engineering and Clinical Psychology and Cognitive Psychology (as opposed to the 2-digit CIP code which designates general areas such as Engineering and Psychology) Source: THECB

Note: Program counts among institutions are not precise. Different counts can arise from different arrays of programs and disciplines. For example, one institution may offer only one doctoral degree in Physics, where another institution may have doctoral degrees in Theoretical Physics, Atomic Physics, and Solid State Physics.
The Central Texas, Metroplex, Gulf Coast, and South Texas regions have added more doctoral programs in the last 10 years than other regions in the state.

**Doctoral Programs Created at Texas Public Institutions by Region**
**FY 1994 to FY 2003**

Programs counted in the region of the parent institution’s main campus.
Source: THECB
Texas Public Institutions Offering One or More Doctoral Degrees

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>2-Digit CIP</th>
<th>8-Digit CIP</th>
<th>Doctoral Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAMAR UNIVERSITY</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>PRAIRIE VIEW A&amp;M UNIVERSITY</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>SAM HOUSTON STATE UNIVERSITY</td>
<td>3</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>STEPHEN F. AUSTIN STATE UNIVERSITY</td>
<td>2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>TARLETON STATE UNIVERSITY</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TEXAS A&amp;M INTERNATIONAL UNIVERSITY</td>
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<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TEXAS A&amp;M UNIVERSITY</td>
<td>19</td>
<td>84</td>
<td>442</td>
</tr>
<tr>
<td>TEXAS A&amp;M UNIVERSITY-COMMERCE</td>
<td>3</td>
<td>6</td>
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<tr>
<td>TEXAS A&amp;M UNIVERSITY-CORPUS CHRISTI</td>
<td>1</td>
<td>3</td>
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</tr>
<tr>
<td>TEXAS A&amp;M UNIVERSITY-KINGSVILLE</td>
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<td>18</td>
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<tr>
<td>TEXAS SOUTHERN UNIVERSITY</td>
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<tr>
<td>TEXAS STATE UNIV-SAN MARCOS</td>
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<td>0</td>
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<tr>
<td>TEXAS TECH UNIVERSITY</td>
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<td>53</td>
<td>166</td>
</tr>
<tr>
<td>TEXAS WOMAN'S UNIVERSITY</td>
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<td>21</td>
<td>60</td>
</tr>
<tr>
<td>UNIVERSITY OF HOUSTON</td>
<td>16</td>
<td>51</td>
<td>207</td>
</tr>
<tr>
<td>UNIVERSITY OF NORTH TEXAS</td>
<td>14</td>
<td>57</td>
<td>157</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS AT ARLINGTON</td>
<td>12</td>
<td>32</td>
<td>62</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS AT AUSTIN</td>
<td>23</td>
<td>113</td>
<td>668</td>
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<tr>
<td>UNIVERSITY OF TEXAS AT DALLAS</td>
<td>10</td>
<td>18</td>
<td>70</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS AT EL PASO</td>
<td>8</td>
<td>12</td>
<td>30</td>
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<tr>
<td>UNIVERSITY OF TEXAS AT SAN ANTONIO</td>
<td>8</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS-PAN AMERICAN</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>WEST TEXAS A&amp;M UNIVERSITY</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td>168</td>
<td>494</td>
<td>1,992</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS SOUTHWESTERN MEDICAL-DALLAS</td>
<td>4</td>
<td>11</td>
<td>42</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER-SAN ANTONIO</td>
<td>4</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>TEXAS A&amp;M UNIVERSITY SYSTEM HEALTH SCIENCE CENTER</td>
<td>2</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER</td>
<td>2</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER</td>
<td>2</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER-HOUSTON</td>
<td>6</td>
<td>37</td>
<td>83</td>
</tr>
<tr>
<td>UNIVERSITY OF TEXAS MEDICAL BRANCH GALVESTON</td>
<td>3</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td>23</td>
<td>87</td>
<td>211</td>
</tr>
<tr>
<td>TOTAL</td>
<td>191</td>
<td>581</td>
<td>2,203</td>
</tr>
</tbody>
</table>

*UT MD Anderson Cancer Center's doctoral programs are offered in conjunction with UTHSC-Houston. They are not shown here to prevent double counting.

1Broad discipline areas such as Engineering or Psychology

2More specific categories of disciplines, such as Chemical Engineering, Civil Engineering, or Clinical Psychology and Cognitive Psychology
Section III: Critical Issues Concerning Doctoral Education

Concerns and criticisms about doctoral education in Texas and the U.S. are numerous and significant. Those in and out of the academic community are raising the following questions: Is the U.S. producing too many doctoral graduates for the job market to absorb? Are doctoral programs excessively narrow and specialized? Do too many students drop out of their doctoral programs? Of those who stay, do they take too long to complete their degree? Are international students “overrepresented” in doctoral programs at the expense of U.S. students? Are Blacks and Hispanics underrepresented in doctoral programs and are enough efforts being made to increase minority participation in doctoral programs? Which “kinds” of institutions should offer doctoral programs, and in what disciplines? Do institutional aspirations for doctoral programs adversely affect undergraduate- and master’s-level education? Should doctoral programs serve regional and state needs over national needs? Is the quality of doctoral education declining and are the “ratings” of doctoral programs meaningful?

This section will address these questions, beginning with the last one.

A. Quality of Doctoral Programs.

“When your program is ranked by U.S. News and World Report, magic things can fall from the sky.” (comment from a University of California at San Diego professor on a doctoral site visit at The University of Texas at San Antonio, 2003)

Publications such as U.S. News and World Report produce annual national rankings of doctoral programs in selected disciplines. Educational organizations such as the National Research Council (NRC) have also generated ratings of doctoral programs. While highly rated programs gain prestige (and tangible benefits) from their appearance on these lists, many in the academic community question the validity of these rankings as accurate indicators of quality. Both U.S. News and the NRC (in its comprehensive 1995 study) rely, in part, on “reputational data” in which faculty peers (and administrators) provide quality judgments of other programs in their respective disciplines. Ratings, therefore, can be self-perpetuating; i.e., highly rated programs maintain their ratings partially because their reputations are already bolstered by previous appearances on ratings lists. In a recent publication, the NRC acknowledged that at the very least, the precision that these numerical rankings imply is not justified.

There are, however, many quantifiable quality indicators of doctoral programs. The following matrix shows quality measures commonly applied to doctoral programs.
POTENTIAL QUANTITATIVE QUALITY INDICATORS\(^1\) OFTEN APPLIED TO DOCTORAL PROGRAMS

<table>
<thead>
<tr>
<th>Student Measures</th>
<th>Faculty Measures</th>
<th>Program Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Number of students who applied/number accepted/number enrolled</td>
<td>• Number of core (program) faculty by rank: assistant/associate/full</td>
<td>• Percent of students who are full-time</td>
</tr>
<tr>
<td>• Undergraduate GPA (and master’s if applicable) of enrolled students</td>
<td>• Faculty teaching load</td>
<td>• Percent of full-time students with fellowships or research or teaching assistants</td>
</tr>
<tr>
<td>• GRE scores of enrolled students</td>
<td>• Faculty scholarship by recent</td>
<td>• Dollar amount of research and teaching assistant stipends</td>
</tr>
<tr>
<td>• Graduation rate</td>
<td>- Number of publications in main peer reviewed journals</td>
<td>• FTSE/FTFE</td>
</tr>
<tr>
<td>• Time-to-degree</td>
<td>- Number of books</td>
<td>• Volumes of library resources — hard copies and online materials</td>
</tr>
<tr>
<td>• Degrees awarded/year</td>
<td>- Number of book chapters</td>
<td>• Value of equipment for program</td>
</tr>
<tr>
<td>• Passing rates for licensure and certification (if applicable)</td>
<td>- Number of invited papers</td>
<td>• Square feet of space for program</td>
</tr>
<tr>
<td>• Number of graduates employed in field within one year of graduation</td>
<td>• Number of publications/FTFE/year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Faculty research by current</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Number of externally funded federal grants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Total dollar amount of externally funded grants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number of grants/FTFE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number of dollars in grants/FTFE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number of patents issued</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Net revenue from intellectual property</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) These indicators came from several sources, including *A Study of Quality Indicators for Graduate Programs* – Western Michigan University, *The University of Texas System Accountability and Performance Report Framework and Performance Measures 2003*, Coordinating Board rules, and other Coordinating Board materials.
Despite the availability of these quantitative indicators of quality, there is no definitive or singular methodology to evaluate doctoral programs. The different weights that evaluators could apply to these measures could clearly produce different results. Contextual variables such as the overall number of doctoral programs offered at the institution can and should also be considered when applying any formulaic methodology to evaluating doctoral programs.

Although there is neither consensus nor precision in evaluating the quality of doctoral programs, judging the effectiveness of these programs remains an important responsibility. And given the recent emphasis placed on accountability in Texas and elsewhere, these judgments, even if imprecise, provide necessary information to policy makers and others in the state. Later portions of this report will discuss some specific measures of quality (as indicated in the matrix) and their relative importance.

B. Differentiated Missions and Doctoral Education

“Higher education’s commitment to improvement has come to be based largely on the Carnegie Classification System and National Research Council’s rankings, which privilege the research model and drive a prestige economy resulting in an increase in PhD programs across the country.” (from Re-envisioning the PhD: What Concerns Do We Have, University of Washington, a report funded by the Pew Charitable Trusts, 2000)

The Texas Higher Education Plan, Closing the Gaps by 2015, states that “different types of institutions... should focus on strengthening their own unique missions.” Clearly, there is and should be great diversity among our higher education institutions. However, determining which institutions should have doctoral programs and in which disciplines is a challenge for Texas and other states.

The California Model. California addresses this issue through its Master Plan for Higher Education. Adopted in 1960, the plan assigns each of three public segments of higher education its own distinctive mission (and potential pool of students). The nine University of California (UC) campuses are the state’s primary academic research institutions, providing undergraduate, graduate, and professional education. Within that group, three institutions (UC-Berkeley, UCLA, and UC-San Diego) are seen as having the broadest graduate research missions. The mission of the 23 campuses of the California State University (CSU) System is to provide undergraduate education and graduate education through the master’s degree, with particular emphasis on applied fields. The UC campuses have exclusive authority for doctoral education with some limited exceptions in which CSU universities can offer joint doctoral programs with other UC or independent institutions. (The third segment of public higher education is the California Community College System).

While not without criticism, the California Master Plan has been praised as a rational, coherent system that 1) eliminates unnecessary competition among institutions, 2) concentrates valuable resources needed for doctoral education and research into a limited (but not exclusive) number of institutions located throughout the state, and 3)
establishes a framework that encourages different types of institutions to reach excellence within their own mission.

Without such a clean differentiation of institutional functions in Texas public higher education, individual institutions (and their board of regents) in the state have more “mission autonomy” and opportunities for change. While this flexibility can be a positive characteristic of a higher education system, a coordinated statewide vision is advisable to guide growth in the number of new degree programs, especially doctoral programs.

**Carnegie Classification.** Many institutions in Texas and elsewhere look to the Carnegie Classification of Institutions of Higher Education as a framework for designating institutional function. The Carnegie Foundation is a non-profit higher education organization that publishes its classification system, which groups higher education institutions together, based on “institutional functions” as indicated by level of degrees awarded and the number of disciplines in which they are awarded. But unlike the California model that designates which institutions are able to grant doctoral degrees, the Carnegie Classification system merely reflects what a given institution is like (as measured by the Carnegie definitions) at a certain point of time.

The Carnegie Classification System has changed several times. The current Classification, introduced in 2000, has two types of doctoral-granting institutions, two types of master’s-granting institutions, three types of baccalaureate-granting institutions, and a category for associate-granting institutions. The two doctoral categories are distinguished as:

**Doctoral/Research Universities — Extensive:** These institutions are “committed to graduate education through the doctorate…and award 50 or more doctoral degrees per year across at least 15 disciplines.”

**Doctoral/Research Universities — Intensive:** These institutions award “at least 10 doctoral degrees per year across three or more disciplines, or at least 20 doctoral degrees per year overall.”

Six of Texas’ 35 public universities (17 percent) are classified as Doctoral Extensive Universities and another six public universities (17 percent) are listed as Doctoral Intensive. In comparison, eight of California’s nine UC universities are listed as Doctoral Extensive institutions and the remaining UC campus is a Doctoral Intensive institution. (One CSU institution is also listed as a Doctoral Intensive university because it offers a number of joint doctoral programs with other institutions.) Therefore, 25 percent of California’s public universities are Doctoral Extensive and 6 percent are Doctoral Intensive. Nationwide, 19 percent of public senior colleges and universities are listed as Doctoral Extensive and 12 percent are classified as Doctoral Intensive.

The Carnegie Foundation provides its Classification of Institutions as a research tool. By grouping institutions by some common measures, the Classification allows institutions to identify peer institutions for comparison purposes. The Foundation recognizes that its Classification is but one of a number of ways to cluster institutions by
function and that no one taxonomy can capture the complexity and diversity of higher education institutions. The Foundation also makes clear that the Classification is not a ranking system and cautions institutions not to use the Classification as a “policy lever to drive institutional change.” Despite these directives, the Foundation recognizes that competition among institutions has led some campus administrations to aspire to “move up the Carnegie Classification as an explicit institutional goal.”

In fact, when the Foundation revised its Classification in 2000 (from the previous 1994 edition), some of its changes reflected this concern. It reduced the number of categories of doctoral-granting institutions from four to two, in part, to deflect institutions’ efforts to use the Classification as an academic hierarchy. Institutional mission change is not improper, and institutions add doctoral programs for many legitimate academic reasons. As institutions grow and add programs at different levels, their Carnegie classifications may indeed change. However, the Carnegie Foundation believes that institutional growth and change just for the sake of Carnegie mobility is not a commendable educational goal.

Growth of Doctoral Programs and Institutional Aspirations. Whether driven by Carnegie status or not, many institutions in Texas have added doctoral programs in recent years. The following table shows the number of new doctoral programs initiated (and closed or consolidated) at Texas public universities and health-related institutions.

**Number of Doctoral Programs Initiated and Closed or Consolidated at Texas Public Universities and Health-Related Institutions from 1993-2003**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>New¹</th>
<th>Closed or Consolidated²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>1995</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>1996</td>
<td>6</td>
<td>14</td>
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<td>1997</td>
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<td>6</td>
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<tr>
<td>1998</td>
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<td>1999</td>
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<td>2000</td>
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<td>2001</td>
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<tr>
<td>2002</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>2003</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>FY 1994-2003</strong></td>
<td><strong>106</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

¹ New programs include distinct majors under the same general area. For example, Business Administration-Accounting and Business Administration-Finance at The University of Texas at San Antonio were counted as two new programs.

² Approximately 10% of the programs were closed and 90% were consolidated (combining different specialty areas into one). For example, at Texas A&M University, Physical Anthropology, Cultural Anthropology, and Anthropology-Archaeology were combined into one doctoral program in Anthropology.
The number of doctoral programs established in Texas in each of the last two years is greater than in any of the previous eight years. And the 10-year total of 106 new doctoral programs compares to 271 new bachelor’s programs and 334 new master's programs during the same period. Of the 711 new degree programs created in the last 10 years, nearly 15 percent were doctoral programs.

Institutional interest in doctoral programs occurs for many reasons. Certainly, some new doctoral programs begin as a direct response to an overt need for doctoral-level expertise in a particular discipline at the regional, state, and national levels. Other programs are developed to tap into a particular institutional interest (or historical involvement) in a particular discipline; this interest is often a result of the institution’s proximity to natural resources associated with the discipline. Faculty can also drive the desire for a new doctoral program. For example, faculty may wish to have more opportunities to do research in the field, to mentor doctoral students, or to be part of a program which is similar to the one in which they received their doctoral education. Finally, while difficult to quantify, some institutions may seek doctoral programs in response to political expectations or in a quest to potentially enhance the prestige of their institutions.

Of course, in many cases doctoral programs are created for a combination of some or all of the above reasons. And there is no harm for an institution to note its Carnegie Classification change as it adds programs. However, the Coordinating Board staff believe that there is a need for more state guidance, beyond that provided by the Closing the Gaps plan and the current mechanism for granting planning authority, for the development of doctoral education in Texas.

C. Attrition and Time-to-Degree

“There must be a breakthrough on time-to-degree, and I don’t think that is uniformly part of the way faculty members think and behave. We fool ourselves into believing that the best times in the lives of these students are when they are under our wing.” (from a faculty respondent to a survey as conveyed in Re-envisioning the PhD: What Concerns Do We Have, University of Washington, a report funded by the Pew Charitable Trusts, 2000)

Two common criticisms of doctoral programs are that not enough students finish them and those that do finish take too long to complete their studies. These issues significantly affect many doctoral students and affect the efficient use of the resources Texas provides its institutions.

Attrition. There are no comprehensive national statistics available on attrition rates of doctoral programs. However, the Chronicle of Higher Education and the Carnegie Foundation report that several institution-specific studies (and some state studies) indicate attrition rates of doctoral programs are 40 to 50 percent. (Attrition rates for doctoral students in Texas are not available. Coordinating Board staff will review this issue and develop recommendations, if warranted.) In general, attrition is highest in the humanities, then social sciences, and lowest in the sciences. Women are more likely to
leave doctoral studies than men, American students leave at higher rates than international students, and Hispanics and Blacks are more likely to leave than Whites.

Most studies suggest that students leave not so much for academic reasons but because of either financial reasons or a lack of significant involvement in the department and program. Students holding either research or teaching assistantships are in the best position for meeting these concerns. Assistantships provide financial support and opportunities for students to interact with other students (graduate and undergraduate) and with faculty. (Graduate assistants have office or lab space at the institution.) A science graduate assistant, in particular, is integrated quickly into department life, as he or she is usually assigned (even if temporarily) to a professor’s lab upon entry into the doctoral program. The doctoral student usually works closely with the faculty member and with students.

Those in academia do not expect that doctoral programs will reach the completion rates of clearly defined professional degrees like law and medicine. Doctoral programs will also likely have higher attrition rates than master’s programs, which are considerably shorter in length than doctoral programs. However, given the significant financial investment by institutions, by states, and by the federal government in doctoral education and the considerable personal investment by students, all parties must increase efforts to improve the completion rates of doctoral students.

Time-to-degree. The process of completing a doctoral degree varies widely by institution (and departments within an institution), by discipline, and, of course, by student. The National Science Foundation reports that the national median “registered time-to-degree” (the total time a student is enrolled in a doctoral program from after completion of a baccalaureate degree to the receipt of the doctoral degree) was 7.6 years (in 2002). This figure has been rising steadily over the last 30 years. (Time-to-degree in 1972 was 5.8 years; 1982, 6.5 years; 1992, 7.2 years.)

Time-to-degree is considerably higher in education and the humanities than in engineering and the sciences (although some doctoral graduates in the sciences complete a post-doctorate position before seeking permanent work). Also, time-to-degree for Blacks is higher than for other ethnicities.

The Council of Graduate Schools reports that some of the same factors affecting attrition rates also affect time-to-degree, including adequate financial support and effective faculty mentoring. Part-time students, such as many in the field of education, take longer to graduate than full-time students. Of course, the actual degree requirements (number of semester credit hours, number and type of qualifying exams, and dissertation requirements) directly affect time-to-degree. Institutional desires to ensure both breadth and depth of disciplinary competence for students result in additional semester credit hours to the curriculum. (See next section.) While this is especially true of programs that are by their very nature interdisciplinary (such as environmental sciences), students in more focused disciplines also benefit from exposure to related fields as advocated in the Re-envisioning the PhD report. In addition, doctoral programs want to expose their students to multiple research methodologies to ensure that students’ research capabilities extend beyond the techniques used in their dissertations. And in response to concerns
that doctoral education only prepares graduates to conduct research, some doctoral programs add pedagogy courses as part of the required curriculum. The motivation behind these efforts is laudable, and the benefits received by students are often important, but they can also result in lengthening time-to-degree. Therefore, higher education officials should continually evaluate doctoral degree requirements to balance their benefits against maintaining a reasonable time-to-degree for students.

D. Specialization of Doctoral Education: Depth versus Breadth

Metabolic engineering of enhanced hemolysin secretion in Escherichia coli by substitution of synonymous codons based on genomic and proteomic analysis (dissertation from student at Cornell University, 2004)

An inspection of some doctoral dissertation titles (like the one above) raise concern that doctoral education has become a pursuit of very narrow specialized research within a discipline (or sub-discipline) that has little or no utility to the real world. Accordingly, some people suggest that doctoral graduates could be ill-prepared to participate in a more global, team-oriented, inter-disciplinary workforce, whether in academia, government, or industry.

However, one needs to look beyond the dissertation to examine the validity of these concerns. While some dissertations can be extraordinary narrow, a measure of specificity should be expected because a dissertation should create new knowledge in the field. In addition, dissertation findings can sometimes be generalized to broader applications. Most importantly, the process itself of formulating research questions, selecting and applying a methodology, and determining the results can (and should be) applicable to multiple settings. Finally, it demonstrates the student's mastery of these processes and suggests the benefits of future work products.

Still, the struggle between depth and breadth in doctoral education is a real one. The cultures of some doctoral programs foster a disciplinary isolation, which then transfers to doctoral students and their research. Certainly, curricular and research depth bring potential benefits to the students who can become and claim to be experts in a particular area. However, potential employers in industry, government, and even academia also want graduates with "transportable skills" that can be applied in varied circumstances. And creating new knowledge in the workforce often means bridging the connections between disciplines. Such workforce requirements call for a broader curricular approach to doctoral education and for more opportunities for doctoral students to work collaboratively with others in and out of their field. Institutional efforts to broaden doctoral education include:

- Curricula that are more interdisciplinary;
- Curricula that include required minors or at least cluster of courses in areas outside the students’ specialized discipline (e.g., economics for political scientists or computer science for physicists);
- Research courses that require students from different fields to work together on a project;
• Dissertation studies in which faculty from outside the department and/or from industry or government are significantly involved with the students’ work; (While it is traditional that students must have at least one committee member from outside the department, this person often plays a modest role in the dissertation study.)
• Pedagogy courses to enhance teaching skills;
• Doctoral internships in industry or government settings; and
• Teaching and research assistantships.

Of course, these efforts take time and potentially contribute to a higher time-to-degree for students. As mentioned in the previous section, the benefits of these practices must be weighed against adding to the time students take to graduate. However, graduates with broad-based competences and the ability to transfer critical thinking and analytical skills to different circumstances are becoming more valuable to the workforce.

E. Diversity in Doctoral Education

“More than one-third of the nation’s workers are people of color. So are more than one-fourth of America’s college students. But the percentage of racial/ethnic minorities who are faculty in higher education is a small fraction of the total. The primary reason that there are not enough racial/ethnic minority faculty is that too few minorities earn doctoral degrees and choose to become members of the teaching and research staffs at colleges and universities.” (Mark Musick, President, Southern Regional Education Board in Diversity in College Faculty: SREB States Address a Need, a special report, 1999)

According to the U.S. Department of Education, approximately one of every four recipients of a doctoral degree in the U.S. (and Texas) is an international student. Only 4 percent of the doctoral degrees awarded to U.S. citizens across the nation went to Hispanics, and 6 percent went to Blacks in 2001. These figures for Hispanic and Black students compare poorly to the 13 percent and 12 percent representation of these groups (respectively) in the general U.S. population. In Texas, Hispanics and Blacks are also underrepresented in doctoral education. Hispanics received 7 percent of doctoral degrees awarded to non-international students in Texas, but they represent 34 percent of the state’s population. Blacks received 5 percent of doctoral degrees awarded to non-international students in Texas, but they represent 11 percent of the Texas population. Whites and Asians are relatively overrepresented in doctoral education in both the U.S. and Texas. There are many concerns about the above figures from inside and outside of higher education.

International Students. In fall 2003, at The University of Texas at Austin, there were 1,969 international students enrolled in doctoral programs, compared to 1,728 Texas residents. At Texas A&M University, there were 1,589 international students enrolled in doctoral education, compared to 1,170 Texas residents. Two other Texas public higher education institutions had more international students than Texas residents.
in doctoral programs. As data presented earlier in this study indicate, international students make up a particularly high percentage of doctoral students in sciences, math, and engineering. Despite the many criticisms of U.S. doctoral education, the rest of the world continues to send its students to American institutions. But concerns in the U.S. about international students crowding out American students and competing in the U.S. job market arise frequently from several sectors.

While international students who remain in the U.S. clearly compete with Americans for jobs, the Association of American Universities (AAU) suggests that efforts to limit or reduce the international presence in U.S. doctoral education are unwarranted. The AAU notes that some of the strongest students enrolled in doctoral education in the U.S. are international students, and these students therefore enhance the intellectual (and cultural) climate of these programs. In addition, the international students that stay in the U.S. after graduation (about half) are assets to their employers, and those that leave the U.S. strengthen the workforce of their native countries. These students can also take back with them a better understanding of U.S. culture.

Rather than discourage enrollment of exceptional international students, which (by percentage) has remained relatively constant over the last 10 years, the AAU and others advocate trying to develop the U.S. talent pool, particularly Black and Hispanic students.

**Black and Hispanic Students.** The concern about under-representation of Black and Hispanic students has been expressed for decades. In an ideal educational system, you would expect (and desire) proportional representation from all sectors of the overall population to participate in all levels of education. Because of the under-representation of Blacks and Hispanics in doctoral education, these groups are also underrepresented in fields that require doctoral degrees, such as in academia. Of the faculty at Texas public universities, only 7.7 percent are Hispanic and only 4.8 percent are Black. In what is often described as a self-perpetuating cycle, the lack of Black and Hispanic role models in faculty positions (and in government and industry) can discourage, or at least fail to encourage, Black and Hispanic undergraduates from seeking advanced degrees.

Of particular concern is the lack of Blacks and Hispanics in particular fields of doctoral education. As indicated in Section II, a fifth of Hispanics and over a third of Blacks in doctoral education in the U.S. are concentrated in the field of education. In Texas, nearly a third of doctoral degrees awarded to Hispanics in 2001 were in education fields and over a half of doctorates awarded to Blacks were in education. The percent of these two groups receiving doctorates in the fields of science and math were considerably lower than the percent of other ethnicities receiving doctorates in these fields. The AAU places primary responsibility for change upon the nation's universities and suggests that these institutions work with both K-12 and undergraduate institutions to encourage Black and Hispanic students to prepare for and pursue doctoral education; the pipeline for these students to enter doctoral education must be expanded. The under-representation of Blacks and Hispanics in doctoral education continues to be a troubling problem.
F. Workforce Needs

“There is considerable evidence that there are far more job seekers than there are tenure-track jobs available, and that this structural imbalance, rather than being temporary is the new status quo.” (from At Cross Purposes: What the Experiences of Today’s Doctoral Students Reveal About Doctoral Education, a report for the Pew Charitable Trusts, 2001)

While there are no governmental sources for employment data that capture the entirety of U.S. doctoral education, a number of national surveys (such as in the Pew report referenced above) have produced significant information about the workforce demand for and supply of doctoral graduates.

Tenured Faculty Positions. The Pew report shows that less than half of doctoral graduates eventually work as tenure-track faculty at universities and health-related institutions, and employment and student interest in these positions vary considerably for different disciplines. For example, only 60 percent of English doctoral graduates end up as tenure-track faculty, versus 80 percent who desire such positions. In chemistry, less than 20 percent of doctoral graduates end up with tenure-track positions versus over 35 percent who wish to be tenured faculty. Higher job interest for faculty positions from English graduates generally reflects the more limited career options for doctorally trained English majors. (Philosophy doctoral graduates expressed the highest interest in tenured positions, at nearly 90 percent.) In contrast, chemistry doctoral graduates have significant job opportunities in industry. Still, since interest in faculty jobs exceeds available positions in nearly all disciplines, supply exceeds demand with respect to academia. (This may change, as indicated below.) There are a few exceptions in some disciplines, such as nursing, in which there is a nation wide shortage of doctorally trained nursing faculty.

Non-Tenured Faculty and Community College Positions. Some doctoral graduates who do not receive tenured positions accept non-tenured positions at universities and health-related institutions. Individuals with these positions are often part-time and have no guarantee of employment beyond a semester or year. Some non-tenured positions can be full-time, but are still “temporary.” Occasionally, institutions will hire permanent, non-tenured faculty as “instructors” or “lecturers.” While permanent, these positions are paid less (usually significantly) than tenured positions and offer little or no opportunity for faculty to pursue research interests. The number of non-tenured faculty at universities and health-related institutions has increased in the last several years, largely to reduce faculty costs. The AAU reports that 30 percent of university faculty positions nationwide are non-tenured. To most faculty, however, these positions are not as desirable as tenured positions. And while these faculty are often excellent instructors, many in academia feel that too many non-tenured faculty can diminish the academic quality and scholarly environment of an institution. Texas, operating under the premise that tenured and tenure-track faculty provide the highest quality instruction, encourages universities to use more tenured and tenure-track faculty by providing a 10 percent increase in formula funding for lower-division courses taught by these faculty.
Many doctoral graduates have careers as faculty at community colleges. According to the 2001 Pew Report, 20 percent of full-time faculty in the U.S. (and many more part-time faculty) teach at community colleges. The report also indicated, however, that less than 4 percent of doctoral students strongly prefer positions at community colleges.

Despite the current oversupply for tenured positions (in most disciplines) and despite the possibility of less desirable non-tenured positions, the lure of academia is strong for many doctoral students. The 2001 Pew report states that many students are unaware of the challenging job market for tenured positions and have a “naïve optimism” toward their job prospects. Others want to test the market and compete for academic jobs despite an accurate knowledge of a difficult job market.

The Aging Professoriate. Hopes for an increase in the number of available faculty positions rest in large part on expectations of significant faculty retirements in the next few years. A survey conducted by the Higher Education Research Institute at the University of California at Los Angeles in 1999 indicated that nearly a third of the full-time faculty in the U.S. were 55 or older. Most members of this “graying professoriate” were hired in the 1960s and early 1970s as a result of an influx of “baby boomers” then entering higher education institutions. As a group, these faculty are at an age or nearing an age when many faculty retire.

With these retirements, not only will new doctoral graduates have opportunities for faculty positions, but institutions will have opportunities to bring in faculty with new and different areas of expertise and ideas about teaching. In addition, new hires can address institutional concerns about gender and ethnic diversity, as many retiring faculty are disproportionately white and male. However, with the elimination of forced retirement of postsecondary faculty in 1993 (as a consequence of the expiration of amendments to the Age Discrimination in Employment Act), it is difficult to predict with precision the retirement patterns of these faculty. Some faculty are remaining at institutions into their 70s. Even with a substantial amount of faculty turnover, there are few predictions of a reversal of the supply and demand patterns of doctoral graduates and faculty positions. Also, cost constraints are likely to continue to affect the number of the tenure-track positions in higher education.

Non-Academic Positions. While competition for tenured positions remains tight, the percentage of doctoral recipients obtaining employment outside of academia is increasing. There are attractive career choices for doctoral graduates in business, government, health-related facilities, and non-profit organizations (with graduates in various disciplines facing varying challenges in justifying the relevance of their degrees to employers in these fields). Doctorally-trained engineers for example, find work in industry in positions that require the research skills that they possess. In fact, the AAU reports (through a survey from the National Research Council) that two-thirds of doctoral graduates in engineering are employed in non-academic positions. And nearly half of doctoral graduates in the sciences also find work outside academia. Because of opportunities in industry and government for doctoral graduates, many higher education stakeholders feel that institutions should promote non-academic positions as having an
equal status as faculty positions and should devise doctoral programs that prepare students equally for careers inside and outside of academia.

Matching Need and Job Skills. While survey data, such as in the 2001 Pew report, reveal much about doctoral-level placement and employment, it is not possible to quantify precisely the need for doctoral graduates in various disciplines, particularly in industry and government. Unlike academia, in which a doctorate is needed (or at least desirable), the need for doctorally trained graduates in non-academic positions is much more variable. Certainly doctoral graduates take positions in which a doctorate (and doctoral-level research skills) are not required or asked for. Also, some employers may favor applicants with doctorates (or require a doctorate) even though the position will not draw meaningfully on the employee’s doctoral training. Both situations are probably inefficient, and the oversupply of doctoral graduates in academia (in most disciplines) remains problematic.

Accordingly, some stakeholders outside of academia encourage institutions to take greater control over the number of doctoral students admitted into their programs. Some academicians believe, however, that the intellectual benefit of a doctoral education has value outside the job market and that society benefits from a more highly educated populace. They argue that if students want to earn doctorates in fields with limited job opportunities, then they should be allowed to do so. But with the state bearing much of the cost of such an education at public institutions, in economically challenging times, and with increasing competition for state resources, it is difficult to justify such outcomes without more overt benefits to the state.

G. Regional Needs versus State and National Needs

“As a small doctoral program serving the local area, the program as proposed is likely to be viable in the short run. However, in the longer term a regional program is very likely to experience serious difficulties. Because this discipline at the doctoral level is in a highly specialized field, a regional program is likely to experience increasing difficulty over time in attracting qualified students and placing graduates in positions that make good use of their expertise.” (from a consultant report for a proposed Texas doctoral program, 2003)

As indicated in Section I, doctoral education inherently has much more of a national scope than most baccalaureate and master’s programs. Institutions recruit students on a national and international basis, and graduates often seek employment far from the institution from which they received their doctorate. There are several reasons for this.

The job market for doctorally trained graduates can be limited, and applicants must often extend job searches well beyond a particular region to obtain employment. This is particularly true for jobs in academia. As a general rule, institutions do not hire their own graduates for tenure-track faculty positions. Therefore, potential faculty jobs in the region are largely limited to community colleges or at the local university in a non-
tenured position. These positions, as indicated previously, are often part-time and mostly non-permanent.

While governmental agencies and businesses hire doctoral graduates from local universities, there are often a limited number of positions that demand doctoral-level expertise. With a local university or health-related institution graduating a continuous supply of doctorally trained individuals in a given field, the local market in all but the largest cities and in all but the most fluid fields will likely become saturated within time. For these reasons, doctoral graduates often have the best job opportunities outside the region of the university.

Institutions must also look outside the region when recruiting doctoral students. While doctoral programs attract local students, after a period of time, the student pool in a region will begin to diminish for given doctoral programs. Most people in academia agree that it is healthy and desirable that doctoral programs have a national and international focus. Universities and health-related institutions do not hire their own doctoral graduates because it is best if new faculty from different educational environments bring different ideas and fresh perspectives to apply to their respective disciplines. It is also desirable to draw students into doctoral programs from different undergraduate universities, from different parts of the state and nation, and from different countries. Such diversity enriches the doctoral experience for all.

There are some exceptions to the need for nationally based doctoral programs. Doctoral programs in large metropolitan areas have much larger student pools to draw from, and the job market in the region can potentially absorb many graduates. The same is often true of the first few years of a new doctoral program even in smaller areas, as students are ample and jobs for graduates are available. In addition, doctoral programs in some disciplines can be sustained on a regional basis. For example, many Educational Administration (or Educational Leadership) doctoral programs (particularly EdD programs) have steady demand from students (sometimes as cohorts) who already hold administrative positions in local school districts. Even in these situations, doctoral programs can be enhanced with more geographically rich intentions.

The following charts and tables show the resident status of doctoral enrollment at all Texas public universities and health-related institutions (in fall of 2003). Statewide, 47 percent of doctoral students were Texas residents, 17 percent were from other states, and 36 percent were international students. These figures compare to 93 percent Texas residents, 3 percent out-of-state, and 4 percent international students for public baccalaureate education and 76 percent Texas residents, 7 percent out-of-state, and 17 percent international students for public master’s programs.
Students at Texas Public Universities and Health-Related Institutions by Residence and Level, Fall 2003

Undergraduate
- International: 4%
- Texans: 93%
- US Out-of-State: 3%

Master's
- International: 7%
- Texans: 76%
- US Out-of-State: 17%

Doctoral
- International: 17%
- Texans: 47%
- US Out-of-State: 36%

Source: THECB CBM-001 Student Report, Fall 2003
### Fall 2003 Doctoral Enrollments

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<tr>
<th>Institution</th>
<th>In-State</th>
<th>Out-of-State</th>
<th>International</th>
<th>Grand Total</th>
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<td><strong>Grand Total</strong></td>
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<td><strong>3,190</strong></td>
<td><strong>6,556</strong></td>
<td><strong>18,325</strong></td>
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</tbody>
</table>
Higher education in the U.S. is built upon the premise that while each state should educate its own people for in-state jobs, each state also has a responsibility to educate doctoral students for jobs outside the state and nation, for mutual benefit of all. Higher education in Texas reflects this premise and benefits from it. Only about one-fourth of doctorally prepared faculty at Texas public universities and health-related institutions received their degrees from Texas public institutions (as indicated in the institutions’ 2003 catalogs). The University of Texas at Austin (UT) with 30 percent and Texas A&M University (TAMU) with 25 percent produced over half of these faculty. The University of Houston (10 percent), Texas Tech University (9 percent), the University of North Texas (8 percent) and Texas Woman’s University (5 percent) have produced most of the rest.
Section IV: Costs and Benefits of Doctoral Education

Doctoral education is expensive, with significant costs that must be covered by Texas institutions, the state, and doctoral students themselves. However, all three of these affected groups receive considerable benefits from doctoral education. This section will examine the costs of doctoral education in Texas and identify its benefits, including some that are less obvious.

A. Costs to Students

While nearly half of all doctoral students across the U.S. receive assistantships (according to the Department of Education), the stipends these students receive do not generally cover the cost of living. Doctoral students who do not receive assistantships must find the financial support elsewhere. In 2002, the Council of Graduate Schools reported that 46 percent of doctoral students incur education-related debt that averages $36,300 at graduation. After completing a master’s degree, Texas public university doctoral students take an average of 59 semester credit hours. If no waivers or financial aid is provided, this translates into an average direct student cost for Texas residents for tuition and institutional fees of about $20,500. This does not include other expenses such as laboratory fees, course fees, special departmental fees, or books.

Another impact on student costs is the length of time required to earn a doctorate. As indicated in Section III C, the median time to complete a doctoral degree is 7.6 years of enrollment past a bachelor’s degree. This amount of time results in considerable costs to doctoral students for living expenses, tuition and fees, and forgone wages.

B. Costs of Doctoral Programs to Texas Public Universities and Health-Related Institutions

Coordinating Board staff used two different approaches to approximate average institutional costs for doctoral programs. The first approach examined the projected five-year costs for doctoral programs authorized by the Board between January 2000 and January 2004. Those 34 (at 32 universities and two health-related institutions) doctoral programs (only single PhD or EdD degrees, not combinations of master’s plus doctoral degree) averaged $2,045,045 per degree in new costs incurred by the institution, with a range of $95,000 to $6,077,246 and a median of $1,614,500. The large range occurs primarily because of the variance in the capability of some institutions to utilize existing resources for new doctoral programs. For example, larger institutions could sometimes reallocate faculty. In addition, higher costs were associated with science and engineering programs.

The greater costs for science and engineering programs are often a result of expensive equipment, laboratories, and materials needed for these programs. Also, faculty costs (often a substantial portion of the five-year new cost total) are generally higher in these disciplines than in many other fields. In addition to new faculty costs, graduate assistantships represent a significant cost to universities and health-related
instiutions in maintaining doctoral programs. Of the programs reviewed, graduate assistantships averaged $15,647 per year for half-time work. The range of these assistantships was $10,000 to $25,000 and the median was $15,000. As expected, higher paid assistantships were generally associated with science and engineering degrees.

A second approach examined the total operational costs of existing doctoral programs through a study conducted by the Coordinating Board's Division of Finance, Campus Planning, and Research. In this study, institutions provided the Coordinating Board with operational costs (including faculty salaries, student services, academic support, and department operations) disaggregated by level of instruction — baccalaureate, master's, and doctoral education. The 20 public universities that have doctoral programs in Texas spent a total of $564,444,480 to educate the 12,823 doctoral students (full-time equivalent or FTSE) in Fiscal Year 2002, for an average of $44,019 per FTSE. This compares to an average of $18,024 per FTSE for master's education and $8,430 for bachelor's education.

There are a number of reasons why doctoral education is so much more costly than baccalaureate and master's-level education. Doctoral-level classes on average are much smaller than baccalaureate classes and somewhat smaller than master's classes. Also, doctoral dissertation advisors and other faculty spend a considerable amount of time individually with their doctoral students as they mentor them through their programs. With this responsibility and the expectation to conduct research and publish the results of that research, doctoral faculty usually have a numerically lower classroom teaching load than other faculty. Although their research efforts benefit the institution and the state through the funds they generate (and in other ways), this increases the cost of doctoral education substantially. In addition, other resources (equipment, laboratories, and library holdings) raise the cost of doctoral education significantly. In short, doctoral programs are expensive because significant resources are needed to support a relatively small number of students.

A comprehensive cost study of doctoral-level education at health-related institutions in Texas has not yet been conducted, but such a study is planned to begin in the near future.

C. Costs of Doctoral Programs to the State

The sources of funding for doctoral programs fall under four general categories: grants/contracts, reallocation of existing resources, formula funds, and other funds (e.g., Permanent University Fund, Higher Education Assistance Fund, gifts and donations, etc.). In reviewing new doctoral programs approved in Texas public universities and health-related institutions from January 2000 to January 2004 (as indicated above), staff found that sources of funding for these new programs were spread somewhat equally over the four sources for the first five years of the programs. However, after the initial years of a doctoral program, institutions begin to rely more on grants and formula funding to support their doctoral programs.
Of particular concern to the state is the amount of formula funding allocated to Texas public institutions for doctoral programs as compared to total formula funding for all instructional levels. The following table shows, for each university with doctoral programs, the total amount of doctoral formula funding received for semester credit hours (SCH) earned in the 2002-2003 base year, as well as the overall amount (for all instruction) of formula funding. Statewide, doctoral SCH accounts for only 2.1 percent of the total SCH generated at universities (236,726 of 11,346,675), but those SCH

<table>
<thead>
<tr>
<th>University</th>
<th>SCHs Doctoral Programs</th>
<th>SCH All Instruction</th>
<th>Percent of SCH</th>
<th>I &amp; O Funds Doctoral Only</th>
<th>I &amp; O Funds All Instruction</th>
<th>Percent of Funding Doctoral Only</th>
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produced 12.4 percent of the total amount of formula funding earned by the universities ($178,532,485 of $1,438,250,329). The University of Texas at Austin had the highest percent of formula funding revenue earned by doctoral courses (nearly 28 percent). On a per SCH statewide basis for the 2002-2003 year, doctoral education was funded at an average of $754/SCH, master's level at $259/SCH, and bachelor's level at $90/SCH.

The formula funding system is structured to provide this kind of disproportionate support for doctoral courses in order to account for the higher costs of doctoral education. Therefore, within each discipline, doctoral courses are “weighted” higher than other levels of instruction. The formula system also differentiates among disciplines, as higher funding rates (across all levels) are given to some disciplines to reflect the higher costs associated with these fields. The range of formula funding for doctoral courses (3 SCH) varies from $1,529.81 for Teacher Education to $3,290.25 for Engineering. (Lower-division liberal arts baccalaureate courses are funded at the lowest level — $153.75 for 3 SCH.)

The next table shows the formula funding provided to Texas public health-related institutions for doctoral education in 2002-2003. Most doctoral programs at these institutions are in the area of biomedical sciences, but programs (PhD and DrPH) in public health, nursing, and allied health account for other areas of doctoral education.
As indicated in the table, the total amount of formula funding provided to these institutions for doctoral education was $22,676,269. This amount represents 5.4 percent of the total formula funding provided to health-related institutions for all instruction. The formula system for health-related institutions is somewhat different than the university system, but it has the same general effect of providing greater funding for increased levels of study.

D. Benefits to Doctoral Students

Doctoral graduates can expect to earn significantly higher incomes than master’s and bachelor’s graduates. According to the U.S. Census, over a lifetime, doctoral degree recipients earn $3,105,793, master’s degree holders earn $2,127,947, and bachelor’s degree graduates earn $1,838,432. On an annual basis, those holding doctorates earn an average of $99,880; master’s degrees — $69,441; and bachelor’s degrees — $60,662.

Another benefit to those who hold doctorates is low unemployment, particularly in science and engineering fields. The National Association of Colleges and Employers reported that the average overall unemployment rate in the U.S. for doctorate holders in 2000 was 0.8 percent and rose to only slightly more than 1 percent in 2001. As indicated in Section III F, some graduates who desire tenure-track faculty positions do not receive such positions. And not all doctoral graduates receive jobs that specifically utilize their doctoral-level training. However, this group as a whole maintains lower
unemployment rates than other sectors of the population. In addition, many doctorate holders enjoy job positions that are personally enriching and bring benefits to others (as indicated below).

E. Benefits to Institutions

Institutions may receive numerous benefits from doctoral programs. In addition to the higher per-semester-credit-hour funding discussed above, an important financial benefit comes through external grant funding awarded to institutions for research projects. Texas public universities garnered $581,313,811 from federal research and development funds in Fiscal Year 2003, while public health-related institutions obtained $639,417,162. By region in Texas, the bulk (93.9 percent) of research expenditures fall into four Texas regions: Central Texas ($826,256,887 – 38.0 percent); Gulf Coast ($676,565,623 – 31.1 percent); Metroplex ($378,056,503 – 17.4 percent); and South Texas ($161,429,874 – 7.4 percent). The influx of federal monies is used to pay for many things, among them graduate assistants, faculty salaries, equipment, materials, and supplies. In addition, most grants come with certain “indirect costs” as part of the grant. Institutions can use these monies (which can be a significant percentage of the direct costs awarded in the grant) to cover general maintenance and operation costs of the institution. Although master’s programs (or even bachelor’s programs) can and do receive federal grant money, principal investigators with access to doctoral-level students and a doctoral program’s accompanying resources are more competitive in securing large federal research and development funds.

According to the National Science Foundation, Texas ranked third in total federal research and development expenditures for 2001, behind California and New York. Other top states (in descending order) were Maryland, Pennsylvania, Massachusetts, Illinois, North Carolina, Michigan, and Ohio. The top five disciplines across the U.S. (as in Texas) were life sciences ($11.1 billion), engineering ($2.8 billion), physical sciences ($2.0 billion), environmental science ($1.2 billion), and computer science ($0.6 billion).

Other benefits to institutions occur as faculty develop patents from their research, and these faculty (and often their institutions) receive monies from the application of intellectual property. (Intellectual property revenue received by Texas public universities and health-related institutions totaled more than $34 million in Fiscal Year 2002.) The Texas Office of Economic Development and Tourism indicated that in Fiscal Year 2003, the state generated 6,509 patents and ranked third in the nation, trailing California and New York. (In Fiscal Year 2001, Texas public universities and health-related institutions received 747 invention disclosures and 164 U.S. patents, executed 99 exclusive and 88 non-exclusive licensing agreements, and formed 31 start-up companies.) Faculty at research institutions help develop and support many patents, regardless of who holds them, and they train the scientists who work in industry. In addition, partnerships between doctoral institutions and private industry (e.g., the $300 million alliance between The University of Texas at Dallas and Texas Instruments) can be formed to provide a boost to new discoveries. Start-up industries and “spin offs” can also be created as a result of doctorally based research.
Less calculable benefits of doctoral education include the national prominence that strong doctoral programs can bring to institutions. Such prominence can attract strong faculty and students (including undergraduate and master’s students) from all over the country and world. This prominence can also draw donations and gifts from alumni and industry.

F. Benefits to the State and Nation

Industry, government, academia (and society in general) benefit greatly from the expertise of doctorally trained graduates. Solving scientific and medical problems that benefit our nation and world often requires the research skills acquired through a doctoral education in these areas. Doctoral graduates in disciplines such as humanities, fine arts, and the social sciences contribute to our understanding of human nature and can enhance the cultural and social environment of our state and nation. Governmental functions can be greatly enhanced through the expertise of doctorally trained employees. And, of course, doctoral graduates serve as faculty at all sectors of higher education. The economy of the state and the U.S. is highly dependent on the success of industry, government, and academia. A stronger economy in Texas brings higher average salaries and larger tax revenues to the state. Therefore, providing these groups with an adequate doctorally trained workforce is a critical function of higher education.
Sections V and VI

The second part of this study will be presented at the October 2004 Board meeting. This part will examine the strengths and concerns of doctoral education specific to Texas. It will also provide recommendations for the state, Coordinating Board, and higher education institutions for enhancing the effectiveness of doctoral education.
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ADDITIONAL DATA SOURCES
Institutional Undergraduate and Graduate Catalogs
National Science Foundation
Texas Higher Education Coordinating Board
U.S. Census Bureau
U.S. Department of Education
DOCTORAL EDUCATION IN TEXAS, PART 2:
RECOMMENDATIONS FOR THE STATE

October 2004
Texas Higher Education Coordinating Board

This report will be available on the Coordinating Board website at
http://www.thecb.state.tx.us/UHRI
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The Texas Higher Education Coordinating Board does not discriminate on the basis of race, color, national origin, gender, religion, age or disability in employment or the provision of services.
Summary of Revisions to the October 20, 2004 Draft of
Doctoral Education in Texas, Part 2:
Recommendations for the State

In response to comments and suggestions made by many institutions and
Coordinating Board members to the October 20, 2004 draft of the doctoral report, the
staff have made the following modifications to that draft:

1. The quality measure “percent of graduates employed in the field within one year
   of graduation,” has been clarified to include graduates taking post-doctoral
   positions (page 3 in the new draft).

2. New language makes it explicit that an institution can ask for planning authority
   (upon approval by the Commissioner) for a doctoral program at times other than
during an institution’s four-year review cycle. Rationale for more flexibility in this
regard has also been included (page 6).

3. Clarifying language has been added to indicate that expanding existing doctoral
   programs is not always the best solution to provide for doctoral growth in a given
   discipline (pages 7 and 9).

4. An additional criterion for planning authority for doctoral program now includes
   whether there is an unmet need for a doctoral program with a unique approach to
   a particular field (page 7).

5. Clarification has been made that staff is not recommending that smaller
   institutions or institutions from less populated areas be prohibited from having
   doctoral programs (page 11).

6. The graph on time-to-degree for health-related institutions has changed for
   Baylor College of Medicine due to corrected information provided by the
   institution (page 23).

7. A final recommendation has been added that the Commissioner appoint a
   standing committee on graduate education that has broad institutional
   representation to advise the staff on implementing the recommendations in the
   report and to provide future suggestions for doctoral education in the state (page
   30).

The new draft, dated October 25, 2004, reflects the above changes. New
language is shaded and deleted language has strikethroughs.
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References

Appendices
Executive Summary

This document, the second of a two part report, raises several “key questions” about doctoral education in Texas and provides 16 recommendations addressing these questions. The recommendations, listed below, are grouped by six doctoral education issues: quality, statewide planning, access and opportunity, diversity, attrition and time-to-degree, and research funding.

Recommendations—Quality:

1. Texas public institutions that grant doctoral degrees should make public to potential and current students the following information about their recent doctoral graduates by program:
   a. degrees awarded per year
   b. graduation/attrition rates
   c. average time-to-degree
   d. percent of graduates employed in the field (or in a “post-doctoral position”) within one year of graduation (separated by academia and other fields)
   e. average amount of financial support (fellowships and teaching and research assistantships) given to full-time students

2. The Coordinating Board should make public the doctoral graduation rates and time-to-degree averages for all Texas public doctoral-granting institutions.

3. The Coordinating Board should conduct (on a periodic basis) statewide surveys and evaluations of doctoral programs in selected disciplines of importance to the state. Institutions would be asked to provide information on the following measures (in addition to what the Coordinating Board already collects):
   a. number and percent of doctoral graduates employed in the field (or in a post-doctoral position) within one year of graduation and the average length of time to secure the job
   b. number of core faculty by rank in the doctoral program
   c. teaching loads of core doctoral faculty
   d. number of peer-reviewed publications/full-time faculty equivalent (FTFE) of core doctoral faculty/year
   e. number of dollars in grants/FTFE of doctoral core faculty
   f. percent of doctoral students in the program who are full-time
   g. percent of full-time doctoral students with fellowships or research or teaching assistantships
   h. dollar amount of research and teaching assistantship stipends for doctoral students
   i. full-time student equivalent (FTSE)/FTFE in the doctoral program

Institutions with low performance would be directed to submit a rationale for program continuance and plans for improvement. Programs would be monitored and, if improvements were not forthcoming, programs could be closed.
Recommendations–Statewide Planning:

1. Require institutions to have planning authority for a doctoral program before submitting it to the Coordinating Board. Planning authority requests to the Board for doctoral programs should usually come during an institution’s regular four-year review cycle. However, upon approval by the Commissioner, the Board may allow institutions to request planning authority at other times if the need for more prompt action is warranted. Institutions should provide a strong rationale for such a request.

2. In addition to the four criteria now applied in considering planning authority for degree programs at any academic level, change Coordinating Board rules to include added criteria applied to doctoral program requests. The criteria specific to doctoral requests would be whether:
   a. there is a demonstrated state and national unmet need (now and in the foreseeable future) for doctoral graduates in the field (not just baccalaureate or master’s-level graduates); or there is an unmet need for a doctoral program with a unique approach to the field;
   b. there is evidence that existing doctoral programs in the state cannot accommodate additional students; or that expanding existing programs would not best serve the state;
   c. the institution has strong baccalaureate- and master’s-level programs in the field and/or strong programs in related and supporting areas;
   d. the program has the marked promise of excellence and the institution is well-suited (sometimes uniquely suited) to offer the program and achieve that targeted excellence; and
   e. the institution’s existing programs (undergraduate and graduate) have demonstrated excellence.

3. Change the name “planning authority” to another term that better denotes the meaning of the designation. The staff recommend the term “preliminary authority.”

4. Perform and implement a statewide needs assessment to identify key disciplines in which the state and nation need additional growth in doctoral graduates and disciplines that have low or no call for growth. The assessment would also include an institutional analysis to identify universities or health-related institutions that would be well-suited to offer high need programs.

Recommendations–Access and Opportunity:

1. Where appropriate, support access to doctoral study through distance education efforts and cooperative programs in selected disciplines to address unmet regional needs.

2. Support additional targeted doctoral programs in areas of the state with high populations, a large number of baccalaureate graduates, and demonstrated, unmet regional needs. This recommendation presumes that the proposed “preliminary authority” criteria would be met.
3. Support doctoral program requests that emerge from the needs assessment process outlined earlier in this report. In particular, support requests from well-suited institutions in regions with fewer doctoral programs, especially if the regions are highly populated.

4. Encourage and expect existing prominent doctoral programs in the state to aggressively recruit students from the state’s regional institutions, particularly those in areas with few doctoral programs.

Recommendations–Diversity:

1. Encourage institutions to implement practices to increase diversity in their doctoral programs such as to:
   - Develop mentorship programs, especially between faculty members and undergraduate students
   - Recruit students from historically Black- and Hispanic-serving institutions that send a high number of their baccalaureate graduates to graduate school.
   - Increase awareness of the various national programs that are available to support Black and Hispanic graduate students financially and academically.
   - In creating budgets, allocate resources specifically for the development of programs and initiatives to increase diversity in graduate education.

2. The Coordinating Board should direct institutions with “low percentages of Black and Hispanic students” in their doctoral programs to formulate a plan to increase participation by these groups and to monitor progress.

3. Continue to support the U.S. Department of Education’s Office for Civil Right’s Priority Plan to Strengthen Education at Prairie View A&M University and Texas Southern University to enhance doctoral education at these institutions.

4. Examine ways to stabilize the presence of international students in doctoral programs.

Recommendation–Attrition and Time-to-Degree:

1. Encourage institutions to implement strategies to increase student persistence and reduce time-to-degree, such as:
   - Providing competitive student financial support for doctoral students in the form of fellowships, research assistantships, and teaching assistantships.
   - Providing adequate advising and mentoring for doctoral students.
   - Provide explicit expectations for doctoral students at the departmental level.
• Implementing specific activities at the institutional, departmental, and individual levels that are designed to increase completion rates, including orientation programs, peer-support groups, dissertation writing workshops, and academic publishing workshops.

• Balancing the deep learning of the disciplinary doctorate with the variety of interdisciplinary challenges.

Recommendation–Research Funding:

1. While recognizing that some important and worthy disciplines are afforded minimal opportunities for federal funding, to address the research goal of Closing the Gaps, the state should especially support doctoral programs that have potential for garnering significant federal research monies or otherwise bring benefits to the state.

Other Recommendation:

1. Establish an on-going advisory committee on graduate education, with broad institutional representation to: a) help implement the recommendations above, b) help evaluate the success of implementation, and c) suggest additional ways to enhance graduate and, especially doctoral, education.
Doctoral Education in Texas, Part 2:
Recommendations For The State

Introduction

Doctoral education is a critical component of higher education in Texas, and the Coordinating Board has a commitment to its success. However, doctoral programs are very expensive, and the state has many higher education needs. It is, therefore, imperative to examine the “condition” of doctoral education in Texas and to attempt to enhance its effectiveness in closing the gaps in participation, success, excellence, and research. If Texas is to receive more financial support for higher education, then the Coordinating Board and public higher education institutions must demonstrate excellence and cost effectiveness at all academic levels, including doctoral education.

Part 1 of the report, delivered at the July Coordinating Board meeting, provided statewide and national demographic trends of doctoral education and raised critical issues and concerns about doctoral education relevant to Texas and the U.S. The following document, which is Part 2 of the report, raises 11 “key questions” about quality, statewide planning, access and opportunity, diversity, attrition and time-to-degree, and research funding of doctoral education in Texas. The document also provides 16 recommendations addressing these questions.
Section V: Recommendations

The recommendations below are grouped by six doctoral education issues: quality, statewide planning, access and opportunity, diversity, attrition and time-to-degree, and research funding. Each issue is addressed by posing key questions, presenting background information, providing recommendations to address the questions, and offering specific rationales for each recommendation.

A. Quality

Key Questions:

1. How can the Board assess the quality of existing doctoral programs at Texas public institutions and what steps should it take to ensure quality?
2. What information should be made public to potential and current students about doctoral programs in Texas?

Background:

Part 1 of this report (pages 22-24) described the many challenges of evaluating the quality of doctoral programs. Despite these challenges, the report maintained that judging the effectiveness of these programs remains an important responsibility. Students, the Coordinating Board, and the state have legitimate interests in obtaining information about the quality of the state’s public doctoral programs. The proposed new accountability system would capture some, but not all, of the information needed for these constituencies.

The Coordinating Board has a thorough process for reviewing and ensuring the quality of proposed new doctoral programs. A staff member provides an initial analysis of a doctoral proposal and then hires two consultants – faculty from prominent programs in the discipline from outside Texas – to review the proposal and participate in a site visit at the institution. After the visit, the consultants write an evaluative report indicating whether the institution has the necessary resources in place to offer a high-quality doctoral program. The institution often makes changes to the proposed program as a result of the consultants’ report, and sometimes the Coordinating Board mandates that changes be made to the program to gain approval for the program. Once the Board approves a new program, the institution must provide to the staff a report on the progress of the program three years after approval.

However, other than collecting data on enrollment and the number of graduates, the Coordinating Board does not conduct routine reviews of existing doctoral programs to ensure that quality measures are in place. In 1987, the Texas Legislature mandated that the Coordinating Board conduct a statewide sunset review of all doctoral programs at public institutions in the state, and the Board reported the results of that review in 1993. Since that time, however, the Board has not engaged in a comprehensive study of existing doctoral programs in the state. The only systematic review of doctoral programs
the Board undertakes is the review (and possible closure) of low-producing programs every four years.

The following recommendations describe methods for evaluating existing doctoral programs and making important information known to the public. Note that the recommendations draw on some of the quality measures identified for doctoral programs listed in the table on page 23 of Part 1 of this report.

Recommendations and Rationales

1. Texas public institutions that grant doctoral degrees should make public to potential and current students the following information about their recent doctoral graduates by program:
   a. degrees awarded per year
   b. graduation/attrition rates
   c. average time-to-degree
   d. percent of graduates employed in the field (or in a “post-doctoral position”) within one year of graduation (separated by academia and other fields)
   e. average amount of financial support (fellowships and teaching and research assistantships) given to full-time students

   Rationale:
   Students should have full disclosure about the previous success of doctoral students in their field at institutions in Texas to help them assess their own potential for success. Also, making this information readily available will make faculty and administrators more accountable for the success of their programs.

2. The Coordinating Board should make public the doctoral graduation rates and time-to-degree averages for all Texas public doctoral-granting institutions.

   Rationale:
   The proposed accountability system already targets graduation rates; time-to-degree is another important measure that can be captured in the Coordinating Board database. The Board can also use these measures as criteria in considering planning authority requests from institutions for future doctoral programs.

3. The Coordinating Board should conduct (on a periodic basis) statewide surveys and evaluations of doctoral programs in selected disciplines of importance to the state. Institutions would be asked to provide information on the following measures (in addition to what the Coordinating Board already collects):

   a. number and percent of doctoral graduates employed in the field (including post-doctoral positions) within one year of graduation and the average length of time to secure the job
   b. number of core faculty by rank in the doctoral program
   c. teaching loads of core doctoral faculty
d. number of peer-reviewed publications/full-time faculty equivalent (FTFE) of core doctoral faculty/year

e. number of dollars in grants/FTFE of doctoral core faculty

f. percent of doctoral students in the program who are full-time
g. percent of full-time doctoral students with fellowships or research or teaching assistantships

h. dollar amount of research and teaching assistantship stipends for doctoral students

i. full-time student equivalent (FTSE)/FTFE in the doctoral program

Institutions with low performance would be directed to submit a rationale for program continuance and plans for improvement. Programs would be monitored and, if improvements were not forthcoming, programs could be closed.

Rationale:

The above measures are important indicators of quality in doctoral programs. The Coordinating Board can also use these measures as criteria in considering planning authority requests from institutions for future doctoral programs.

B. Statewide Planning

Key Questions:

1. Should the Coordinating Board determine if the state has enough doctoral programs in critical disciplines at the appropriate institutions? If so, how should the Board determine this?

2. How can the Coordinating Board provide a more proactive role in the guidance/coordination of the development of new doctoral programs and at what institutions?

Background:

Graduate programs, including doctoral programs, are critical to higher education in Texas. However, with very tight budget constraints imposed on higher education, the Coordinating Board should weigh the importance of any proposed program against the many other needs of higher education. Not all institutions must have a doctoral presence (or multiple doctoral programs) to claim excellence and prestige for their institutions.

As indicated in Part 1 of this report (pages 24-27), determining which institutions should have doctoral programs and in which disciplines is a challenge for the state. The state’s higher education plan, Closing the Gaps by 2015, provides general guidance in this area by advocating for mission differentiation among the state’s public higher education institutions and by requiring institutions to identify targeted programs of excellence. The plan states that “clearly differentiated missions for Texas higher education institutions will give students, parents, business and industry, communities and other interested
people more precise and understandable information about the focus and programs of each institution. . . Most universities should not strive to be research institutions, but rather focus on strengthening their own unique missions. . . Each Texas public higher education institution must identify its strengths and enhance programs critical to its mission. . .”

In addition to this general guidance provided by Closing the Gaps, the Coordinating Board's four-year cycle of Mission Statement and Table of Programs review for institutions is a regulatory process designed to foster mission differentiation and sanction the establishment of specified academic programs at appropriate institutions. The process, which is statutorily mandated, requires each institution every four years to review its Mission Statement for possible revision and to request possible changes to its Table of Programs. The Table of Programs shows in which disciplinary areas (by degree level – bachelor's, master's, and doctorate) the institution has approved academic programs and in which disciplinary areas (by level) the institution has “planning authority.”

Planning authority awarded to an institution for a given discipline (and degree level) is the first part of a two-step process. When granted by the Board, planning authority indicates that the Board approves in principle the “idea” that the institution can offer that program; i.e., the program is seen as appropriate for the institution, and there are no statewide implications that would preclude the institution from offering the program sometime in the future (if relevant expectations regarding quality, need, and cost are met). In step two of the process, the institution develops and submits a proposal to the Coordinating Board staff after the resources for the program are in place. The program must then be approved by the staff or Board, as appropriate.

This two-step approval process has several purposes: 1) it promotes strategic planning by the institution on a four-year cycle; 2) by first requiring planning authority (as the norm), it prevents an institution from putting time, energy, and resources into a proposed program to which the Board might have a fundamental objection; 3) it streamlines the overall approval process, because after an institution has planning authority for a (non-doctoral) program, the eventual proposal can be approved by the staff if it meets specified criteria (e.g. five-year new costs are under $2 million); and 4) in granting planning authority, the Board can judge these requests within a statewide perspective.

The system, as described above, has been a useful planning tool for the Board and state. However, there have been problems and limitations with the process, especially for requests for doctoral programs. In recent years, more institutions have been submitting requests for doctoral programs without first having planning authority for them. The Board does allow simultaneous requests for planning authority and program approval, but such requests are meant to be limited to the occasions in which a need and opportunity for a program come up unexpectedly within the four-year cycle.

The staff also believe that the criteria the Board now uses for granting planning authority are not adequate for doctoral programs. The current criteria, which are undifferentiated by degree level (bachelor's, master's, and doctoral), are: 1) vocational need, 2) unnecessary duplication, 3) critical mass for high level of quality, and 4) whether the program complements and strengthens existing programs. Since doctoral programs are
very expensive (to the institution and the state) and are very different from baccalaureate and master's programs, staff believe these criteria are inadequate for granting planning authority for doctoral programs.

Finally, the two-step approval system has some limitations as a planning tool. While it allows the Board to grant or deny approval, it is still, inherently, a reactive process. It responds to requests by institutions for program approval; it is almost exclusively institution-driven. Institutional strategic planning is important, even imperative, to drive program development in higher education. But planning on the institution level, or even system level, cannot account for all statewide interests.

The following recommendations address these limitations and problems. Note that these recommendations do not preclude any institution in Texas from having doctoral programs; i.e., it is not a "California model" (described in Part 1 of the report). However, it does “raise the bar” in some respects for institutions to demonstrate that the state has a strong need for a particular doctoral program and that the particular institution is best suited to offer that program.

**Recommendations and Rationales:**

1. Require institutions to have planning authority for a doctoral program before submitting it to the Coordinating Board. Planning authority requests to the Board for doctoral programs should usually come during an institution’s regular four-year review cycle. However, upon approval by the Commissioner, the Board may allow institutions to request planning authority at other times if the need for more prompt action is warranted. Institutions should provide a strong rationale for such a request.

   **Rationale:**

   As indicated above, an increasing number of institutions are submitting doctoral program requests without having planning authority for the program. In 2003, over half of the doctoral proposals submitted to the Coordinating Board did not have accompanying planning authority for the programs. When institutions request simultaneous consent for planning authority and program approval, it negates the advantages of the two-step planning process. However, the staff recognize that institutional long-term planning cannot always predict the need for doctoral growth, particularly in fast-emerging fields. Therefore, the recommendation allows a mechanism for out-of-cycle requests for planning authority.

2. In addition to the four criteria now applied in considering planning authority for degree programs at any academic level, change Coordinating Board rules Section 5.24 (a) to include added criteria applied to doctoral program requests. The criteria specific to doctoral requests would be whether:

   a. there is a demonstrated state and national unmet need (now and in the foreseeable future) for doctoral graduates in the field (not just baccalaureate or master’s-level graduates); or there is an unmet need for a doctoral program with a unique approach to the field;
b. there is evidence that existing doctoral programs in the state cannot accommodate additional students; or that expanding existing programs would not best serve the state;

c. the institution has strong baccalaureate- and master's-level programs in the field and/or strong programs in related and supporting areas;

d. the program has the marked promise of excellence and the institution is well-suited (sometimes uniquely suited) to offer the program and achieve that targeted excellence (see “d” below for more explanation of “well-suited”); and

e. the institution's existing programs (undergraduate and graduate) have demonstrated excellence.

Rationale:

As stated above, staff believe that the state would benefit from greater coordination of its doctoral offerings. Doctoral programs require significantly more resources to deliver and, therefore, merit additional scrutiny. The additional criteria in the recommendations are specific to doctoral programs and are important for the following reasons:

a. In some disciplines, demand can be high for master's graduates but quite limited for doctoral graduates.

b. In some circumstances, it would be more efficient and cost-effective to attempt to expand existing doctoral programs in a discipline rather that develop a new one. Expansion could be accomplished in some cases by adding more students (if possible) to existing programs in the same area; in other cases, expansion could take place by adding a specialization to an existing program offering a general program in the discipline. (The staff note, however, that expansion may not always be the most appropriate method to accommodate growth in the discipline.)

c. For doctoral fields that typically have undergraduate and master's programs, it is necessary for an institution to have strong programs at these levels to support a successful doctoral program. While it is true that an undergraduate program and master's program can benefit from the presence of a doctoral program in the discipline, the bachelor's and master's programs should already be sound.

d. With very few exceptions (see next section), the Coordinating Board expects new doctoral programs to have the potential to gain national prominence in their respective fields. In seeking planning authority for a particular doctoral program, an institution should be able to show evidence of why it would be especially well-suited to offer that program. Such evidence could include the institution having: (i) significant existing resources in the discipline, (ii) proximity to necessary resources and needed research opportunities specific to the discipline, (iii) existing significant record of research in the field, and (iv) opportunities for clinical experiences or internships specific to the discipline. Accordingly, the desired doctoral program should be a “fit” for the institution.

e. The missions of all 35 public universities include providing students a high quality undergraduate education. Even at Texas A&M University and The
University of Texas at Austin, the state’s two “research” institutions (as designated by the proposed accountability system), over 75 percent of students are undergraduates. It is critical that the state’s public universities excel at educating this population. Since doctoral programs can divert faculty and other resources away from undergraduate programs, it is reasonable to expect institutions to show evidence of strong undergraduate programs before adding doctoral programs and to offer assurances that new doctoral programs would not negatively affect undergraduate programs. The staff also believe that institutions should show evidence of quality in existing doctoral programs before adding new ones. Institutions should have acceptable graduation rates, numbers of graduates, and time-to-degree figures in most or all of their existing doctoral programs.

The additional criteria identified above for planning authority approval for doctoral programs should help the Board assess the appropriateness of doctoral requests from universities and health-related institutions. And differentiating planning authority criteria for baccalaureate/master’s requests versus doctoral requests is consistent with Coordinating Board rules which identify criteria for evaluating program proposals; i.e., rules for baccalaureate and master’s programs (Section 5.45) are distinguished from rules for doctoral programs (Section 5.46).

3. Change the name “planning authority” to another term that better denotes the meaning of the designation. The staff recommend the term “preliminary authority.”

Rationale:

“Preliminary authority” better conveys the meaning that the Board has “approved in concept” that the institution can offer the program. Institutions should consider “preliminary authority” (which will be used throughout the rest of the report) to be a significant advancement toward being able to offer the degree.

4. Perform and implement the following statewide needs assessment:

**Phase 1: Assessment**

- *With institutional involvement*, develop a statewide needs assessment to identify key disciplines in which the state and nation need additional growth in doctoral graduates and disciplines that have low or no call for growth. For each discipline examined, the criteria used in the needs assessment would include:

  a. Demand for graduates (in academia and other fields)
  b. Demand from students
  c. Potential benefit to the state and nation (research dollars and other benefits)
  d. Current enrollments in Texas institutions and research dollars received by Texas institutions
  e. Costs to institutions and state
Phase 2: Institutional analysis

- For each discipline identified as potentially needing growth, determine if the growth can best and most appropriately be met by expanding and enhancing existing doctoral programs or by creating new programs.

- For each discipline in which growth cannot (or should not) be met by expanding existing programs, solicit institutional interest in the development of a doctoral program. For each of these disciplines, develop an institutional analysis to identify possible universities or health-related institutions that would be well-suited for offering the designated program. For each discipline reviewed, the criteria used (when applicable) in the institutional analysis would include:

  a. Mission compatibility
  b. Institutional interest in discipline
  c. Strong baccalaureate and master’s programs in discipline
  d. Significant existing resources in the discipline and proximity to necessary resources
  e. Significant existing production of research dollars in the discipline
  f. Strong performance measures for existing undergraduate, master’s, and doctoral programs (institution-wide)
  g. Existing programs in the discipline in the region

Phase 3: Institutional response

- Encourage one (or more) “well-suited” institutions to consider developing a program in the discipline. If appropriate, encourage collaborative or joint programs. In particular, support well-suited institutions in regions with fewer doctoral programs. Allow institutions not identified as good candidates for specific programs to make their case for inclusion.

- Discourage all institutions from submitting requests for “preliminary authority” (planning authority) for doctoral programs identified as “low need.”

Phase 4: Reassessment

- Repeat the needs assessment (and other steps in the process) every three to five years.
Rationale:

As mentioned in Part 1 of the report, the number of doctoral programs initiated in the state in each of the last two years is greater than in any of the previous eight years. The report also noted several reasons that drive institutional interests in doctoral programs. Regardless of the reasons, an institutional request for a doctoral program (or planning authority for a doctoral program) often comes without knowledge of other institutional doctoral interests and strengths in the discipline (although institutions within a system should be aware of the doctoral interests of sister institutions). A proactive approach as proposed above could help: (a) make it more likely that requests for doctoral programs come in high-need areas; (b) identify the institutions that are best suited for potential particular doctoral programs and encourage those institutions to develop them; (c) discourage doctoral requests from institutions not well-suited for particular programs; (d) foster collaborative or joint degrees when appropriate; (e) reduce inefficiencies; and (f) place continuing emphasis on the importance of demonstrated excellence in the institution’s existing academic programs.

This process should not and would not preclude institutions and systems from pursuing their own strategic academic planning including doctoral education. (And institutions could still submit requests for “preliminary authority” independent of this process.) However, academic planning on individual campuses should not take place in a vacuum. If different institutions have overlapping goals for doctoral education, then the best system is not to approve programs on the basis of which institution makes the first request. Statewide long-term planning, as described above, would be a very challenging task. However, if successful, it could help foster growth of doctoral programs in needed areas at institutions best suited to deliver these programs.

C. Access/Opportunity

Key Questions:

1. In the development of new doctoral programs, what considerations should be given to areas of the state with few doctoral programs? Should every region of the state offer doctoral programs?
2. What are exceptions to the presupposition that doctoral programs should have a national scope?

Background:

Doctoral programs are inherently resource-intensive. In all disciplines, they require physical resources (laboratories and libraries) and human resources (faculty and support staff) that go significantly beyond – in quantity and quality – the resources needed to support baccalaureate- and master’s-level education. In addition, doctoral programs are
focused or specialized within disciplines to a far greater extent than baccalaureate or master’s programs, which are broader and more general.

Because of that specialization, most doctoral programs need to cast a wide net out to potential students to attract those whose interests, needs, and capabilities match the focus and expectations of the program. Consequently, doctoral education is generally expected to have a national scope, with institutions recruiting students on a statewide, national, and international basis, and graduates often seek employment far away from the institution from which they received their doctorate. Part 1, pages 34-35 of this report provided additional commentary on this topic and also discussed why a national focus for doctoral education is healthy for higher education as a whole. However, as also indicated in that discussion, there should be limited exceptions to these general expectations. For example, in disciplines such as educational administration, where most graduates take positions in the public schools, populous areas can sometimes provide both a steady regional pool of qualified students seeking access to such programs and a steady regional demand for graduates.

With this discussion as a framework, one important question remains: should every region of the state, as a matter of policy, have doctoral programs? As shown on page 19 of Part 1 of this report, three regions of the state have no doctoral programs and one other region has only four programs. If a region of the state has relatively few people, and its institutions produce relatively few baccalaureate graduates, then the establishment of regionally based doctoral programs in that area is difficult to justify. It would be very unlikely that institutions in less populated areas of the state could attract the critical mass of students to financially sustain a regionally based doctoral program.

The staff is not recommending that the Board explicitly prohibit such institutions from developing doctoral programs. We are recommending that proposed programs be nationally focused, meet the proposed “preliminary authority” criteria set forth on pages five to seven of this report, and present a reasonable likelihood of achieving national prominence. Admittedly, it could be difficult for small institutions in less-populated areas of the state to meet certain criteria, such as “whether the program has the marked promise of excellence and the institution is well-suited (sometimes uniquely suited) to offer the program and achieve . . . targeted excellence.” Institutions would have to show they have 1) significant resources in the discipline, 2) proximity to necessary resources and needed research opportunities specific to the discipline, 3) a significant record of research in the field, and 4) opportunities for clinical experiences or internships specific to the discipline (if applicable). Small or regional institutions that do meet “preliminary authority” criteria are likely to do so in “targeted areas of excellence,” rather than across broad disciplines.

There are, however, different implications for state policy for institutions in highly populated areas of the state that produce a large number of baccalaureate graduates but offer few doctoral programs. Staff believe that those areas could support regionally based programs in disciplines of broad appeal (as indicated above). It is also reasonable to expect communities with large populations to have institutions that could offer doctoral programs with a national scope. Even under these circumstances, institutions should be expected to meet the proposed “preliminary authority” criteria, including the “well-suited” criterion. With a larger population base and perhaps more
resources, it is more likely these institutions could meet the criteria (in some disciplines) than could institutions in small communities.

Regardless of how much doctoral growth there is in the state, Texas is unlikely to be able to support doctoral programs in multiple disciplines in every area of the state. Demographics and economies of scale do matter, and ensuring doctoral programs in every region of the state is a questionable educational policy. Access to some doctoral programs for some individuals will either require leaving the region, participating in distance education programs (viable in some fields of study), or participating in collaborative partnerships between regional institutions and institutions with greater resources that can be appropriately extended off campus.

**Recommendations and Rationale:**

1. Where appropriate, support access to doctoral study through distance education efforts and cooperative programs in selected disciplines to address unmet regional needs.

   **Rationale:**

   Regional needs for doctoral graduates in some disciplines clearly must be met through alternative means, as they have always been. Fortunately, additional means, other than leaving the area, are now available and appropriate in some disciplines.

2. Support additional targeted doctoral programs in areas of the state with high populations, a large number of baccalaureate graduates, and demonstrated, unmet regional needs. This recommendation presumes that the proposed “preliminary authority” criteria would be met.

   **Rationale:**

   Populous areas could support selected regionally based doctoral programs. Note, however, that any doctoral program would be enhanced with a wider geographic focus and should strive for that.

3. Support doctoral program requests that emerge from the needs assessment process outlined earlier in this report. In particular, support requests from well-suited institutions in regions with fewer doctoral programs, especially if the regions are highly populated.

   **Rationale:**

   A formal needs assessment could indicate the call for new nationally focused doctoral programs in particular disciplines and could identify the institutions that offer the best promise of success at a very high level. Supporting institutions in regions with fewer doctoral programs would improve geographic access to doctoral programs in the state.
4. Encourage and expect existing prominent doctoral programs in the state to aggressively recruit students from the state’s regional institutions, particularly those in areas with few doctoral programs.

Rationale:

This strategy could help increase opportunity for these students.

D. Diversity:

Key Questions:

1. How can institutions increase student diversity in their doctoral programs?
2. How can institutions maintain an appropriate international student presence in their doctoral programs?

Background:

Students from Underrepresented Groups

As indicated in Part 1 of this study (page 30-31), the percentage of Black and Hispanic doctoral students in most Texas public institutions does not reflect their representation in the overall population of the state or their representation in undergraduate education. Of particular concern is the under-representation of these groups in the disciplines of math and science. Higher education institutions need to develop and implement strategies to increase participation and success of students from under-represented groups. The following chart from Part 1 shows the relative imbalance of doctoral degrees awarded at Texas public institutions by ethnicity.
Note that the public institutions located in South Texas already have a strong commitment to serving the Hispanic population in the region. For example, 43 percent (15 students) of the doctoral graduates for the period 1999-2003 at The University of Texas-Pan American were Hispanic. Other South Texas and border institutions graduating a significant number of doctoral graduates during the last five years are listed in the table below.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Percent of Doctoral Degrees Awarded to Hispanic Students</th>
<th>Number of Doctoral Degrees Awarded to Hispanic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University of Texas-Pan American</td>
<td>43%</td>
<td>15</td>
</tr>
<tr>
<td>Texas A&amp;M University-Kingsville</td>
<td>41%</td>
<td>25</td>
</tr>
<tr>
<td>Texas A&amp;M University-Corpus Christi</td>
<td>38%</td>
<td>12</td>
</tr>
<tr>
<td>The University of Texas at San Antonio</td>
<td>35%</td>
<td>7</td>
</tr>
<tr>
<td>The University of Texas at El Paso</td>
<td>25%</td>
<td>30</td>
</tr>
<tr>
<td>The University of Texas Health Science Center at San Antonio*</td>
<td>7%</td>
<td>11</td>
</tr>
</tbody>
</table>

*Although outside the scope of this study, it should be noted that for the period 1999-2003 UTHSCSA awarded 14% (142 students) of its MD degrees to Hispanic students.

Sources: IPEDS on NSF's WebCASPAR, Tx Higher Education Coordinating Board, U.S. Census Bureau THECB 10/2004
Texas’ two public historically Black universities primarily serve African-American students, although the student diversity of each is increasing. Eighty-two percent (80 students) of the doctoral graduates during the last five years at Texas Southern University were Black. Prairie View A&M University’s first doctoral program began in 2000 and has had no graduates to date. In fall 2003, there were 18 Black doctoral students enrolled at the institution, two Hispanic doctoral students, and three international doctoral students. Although the contribution of these institutions is very important, minority-serving institutions cannot and should not bear the full responsibility of recruiting and graduating significant numbers of Black and Hispanic doctoral students.

International Students

Part 1 of this report also indicated the benefits of having international students in U.S. doctoral programs. From 1991 to 2001, international students represented about one-fourth of the doctoral graduates in the U.S. and Texas. However, recent findings by the Council of Graduate Schools indicate that international student applications and admissions to U.S. graduate schools showed a significant decline for fall 2004.

The results of the most recent survey (conducted in the summer of 2004) indicate a 28 percent decline in international graduate student applications and an 18 percent decline in admissions to U.S. graduate programs. The largest drop (36 percent) was in engineering. Programs in the sciences, which typically draw large numbers of international students, reported an overall decrease of 20 percent in applications. If these declines continue, they will have a considerable impact on the number of graduates over the next five to 10 years. The factors that appear to be contributing to the declines include changes in visa processes after the events of September 11, 2001; increased competition for students with universities in other countries, such as Canada; and the development of high-quality doctoral programs in the sciences and engineering abroad. While recognizing that ensuring national security is critical, the Association of International Educators recently adopted policy recommendations outlined in Promoting Secure Borders and Open Doors to address the visa problems encountered by international researchers, educators, and students wishing to enter or re-enter the U.S. Although Texas would not expect (or desire) to see doctoral programs dominated by international students, the state, nation, and other countries benefit from an international presence in doctoral education. Texas should attempt to preserve such a presence.

Recommendations and Rationale:

1. Encourage institutions to implement practices to increase diversity in their doctoral programs. Efforts at diversifying doctoral programs that have proved successful at U.S. institutions are listed below. (See Appendix A)

   - Develop mentorship programs:
     - Between faculty members and undergraduate students to allow them to work on research projects that permit students to explore their interests, discover their intellectual capabilities, and set academic and career goals. Such programs could help to demystify the academic career path, especially for Black and Hispanic students, some of whom have difficulty
imagining themselves in such careers. (The University of Missouri-Columbia)

- Between faculty members and master’s students to allow students to observe faculty engaged in a variety of professional activities including teaching, research or creative projects, and service. These programs would often include close academic counseling based on the student’s interests, skills, and goals. (Prairie View A&M University)

- Between experienced graduate students and new graduate students or undergraduates. These programs include regular information-sharing meetings, visits to classes that the experienced graduate student teaches, partnership on research or creative projects, and other activities. (The University of Mississippi)

- Develop an on-campus visitation program aimed at recruiting Black and Hispanic graduate students. Include visits with faculty and administrators, informational sessions with current graduate students, class observations, and social activities. (SUNY at Stony Brook)

- Develop internships that provide practical experience in non-academic work environments for Black and Hispanic students not pursuing a career in academia. (The University of Maryland-Baltimore County)

- Establish contact with directors of programs that specifically serve underrepresented Black and Hispanic students to identify strong prospective students in their current undergraduate institutions. (Many institutions do this.)

- Recruit students from historically Black- and Hispanic-serving institutions that send a high number of their baccalaureate graduates to graduate school. (Many institutions do this.)

- Increase awareness of the various national programs that are available to support Black and Hispanic graduate students financially and academically. (Many institutions provide this information online. See Appendix B for a description of some of these programs.)

- In creating budgets, allocate resources specifically for the development of programs and initiatives to increase diversity in graduate education.

(Also, see Appendix C for additional efforts by Texas institutions to increase diversity in doctoral programs.)

Rationale:

Institutions that are currently employing these strategies across the nation and within the state report varying degrees of success. Several of these institutions, having received awards for their comprehensive efforts to create an inclusive environment in graduate programs, indicate considerable increases in enrollments of Black and
Hispanic students and in completion rates for these students. Although some of these initiatives are still in the early stages of implementation, Texas institutions should consider using them or finding similar ways to address the issue of diversity.

2. The Coordinating Board should direct institutions with “low percentages of Black and Hispanic students” in their doctoral programs to formulate a plan to increase participation by these groups and to monitor progress.

Rationale:

Given the low enrollment of Black and Hispanic students at the doctoral level, institutions should be accountable for their efforts to attract these groups to their doctoral programs.

3. Continue to support the U.S. Department of Education’s Office for Civil Right’s Priority Plan to Strengthen Education at Prairie View A&M University and Texas Southern University to enhance doctoral education at these institutions. See Appendix D for a brief description of the Priority Plans and for current efforts at these institutions to increase minority participation in doctoral programs.

Rationale:

The current priority plan for these institutions includes the creation of a number of new master’s and doctoral programs in high-demand fields, such as pharmaceutical sciences, computer science, management information systems, electrical engineering, and educational leadership. Several of these programs have recently been implemented. (See Appendix D for a list of recently approved doctoral programs at these institutions.) The Coordinating Board supports these efforts to provide increased educational opportunities for the underrepresented students served by these institutions.

4. Examine possible ways to stabilize the presence of international students in doctoral programs.

Rationale:

The Council of Graduate Schools reports that, in response to the significant decline in international applications and admissions, many of the institutions surveyed are developing ways to improve the admissions process for international students. For example, a list of policy changes recently implemented by certain schools include: altering the admissions dates to allow potential students more time to deal with visa processes; earlier notification of admission; providing counseling on the visa process by developing print brochures, electronic resources, and workshops; creating a call center to provide service to students who have questions about the application/admission process and the status of their application; and using technology to a much greater extent (e.g., developing or improving electronic applications, virtual orientations, and e-mail notification of admissions status). Texas institutions should examine their own procedures for international graduate student application and admissions to determine if these approaches would be useful.
E. Attrition and Time-to-Degree

Key Questions:

1. How can institutions decrease attrition (i.e., increase graduation rates) and decrease time-to-degree for doctoral programs?
2. How do attrition and time-to-degree vary by discipline and by institution in Texas?

Background:

As stated in Part 1 of this report, studies indicate that 40 to 50 percent of students who begin their doctoral programs do not persist to graduation. In addition, the National Science Foundation reports that the national median “registered time-to-degree” (after the baccalaureate degree) rose from 5.8 years in 1972 to 7.6 years in 2002.

In response to the increasing national (and international) concern about the high level of attrition and increased time-to-degree among doctoral students, there is a growing body of research literature about the factors that influence whether or not students complete their doctoral degree programs. This research has revealed that long time-to-degree correlates with a low completion rate. As one might expect, this research also indicates that there is no single factor that stands out as the “key” way to improve student persistence and success. Instead, findings indicate that multiple factors interact in a complex way.

The weight of the evidence suggests that neither traditional academic indicators nor demographic variables are consistently reliable predictors of persistence to completion of the doctoral degree. Rather, research indicates that other factors need to be considered when developing strategies for positively influencing student persistence and reducing their time-to-degree. These factors are summarized as follows:

1. Research consistently reveals that there are significant differences in completion rates and time-to-degree across major fields of study. Students in the humanities and social sciences have the lowest completion rates; biological and physical science doctoral students have the highest. It appears that writing dissertations pose particular challenges for students in the humanities and social sciences, primarily because these students usually face a solitary research and writing experience and because they are more reliant upon the advising relationship for the dissertation process and doctoral completion. Other explanations for these differences include the generally higher levels of financial support for biological and physical science

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1 Particularly notable is information obtained from: (a) Carolyn Richert Bair’s and Jennifer Grant Haworth’s 1998 “meta-synthesis” of 118 research studies on doctoral student attrition and persistence completed between 1970 and 1998, (b) the 2001 Higher Education Series Report “Factors Associated with Completion of Research Higher Degrees,” and (c) Ronald Ehrenberg’s and Panagiotis Mavros’ 1995 study of the influence of financial support patterns on doctoral completion rates and times-to-degree.
students, higher frequency of research (versus teaching) assistantships for science students, and the greater day-to-day involvement between the science advisor and advisee in the laboratory environment.

2. The financial support offered to doctoral students affects attrition and persistence. Students who hold fellowships, research assistantships, teaching assistantships, or graduate assistantships are more likely to complete their degrees, and in less time, than students who rely on other types of funding.

Of the studies concerning the influence of financial support patterns on completion rates and times-to-degree, one is particularly noteworthy. Researchers found that graduate students who entered PhD programs in economics, English, mathematics, and physics at Cornell University between 1962-1986 had completion rates and times-to-completion averages that were sensitive to the types of financial support the students received. Students who received fellowships or research assistantships had higher completion rates and shorter times-to-degree than students who received teaching assistantships or tuition waivers, or who were totally self-supporting.

3. Difficulties with various aspects of the dissertation are related to attrition. Research indicates the following factors aid in dissertation completion: (a) good advisor who is able to provide constructive feedback and is supportive, interested, and competent; (b) good topic choice that is manageable and interesting; (c) early selection of topic; (d) internal personal strength characterized by independence, high motivation, and ability to endure frustration; (e) self-imposed deadlines and goals; (f) limiting employment; (g) delaying internship until completion of the dissertation; and (h) externally-imposed incentives such as future employment. Research also indicates that the following factors are particularly helpful to students completing dissertations in the humanities and social sciences: (a) working in a collaborative environment, (b) frequent interaction with advisors, (c) having information about academic publishing, and (d) having a suitable financial aid package.

4. The degree and quality of the relationship between doctoral student and advisor has a strong, positive relationship to successful completion of the doctorate. In studies of attrition, students' departure has been found to be due in part to: (a) inadequate or inaccurate advising, (b) lack of interest or attention on the part of the advisor, (c) unavailability of the advisor/faculty to students, or (d) a negative or conflictual relationship between the student and advisor/faculty. Some researchers have identified the student/advisor relationship as the most important variable in doctoral student attrition and persistence.

5. Student involvement in various programmatic, departmental, institutional, and professional activities and opportunities contributes favorably to doctoral student retention and completion. Involvement includes attendance and participation in graduate association meetings, academic activities, social activities, informal and formal meetings, and professional activities.

6. Students' satisfaction with their academic programs contributes favorably to doctoral degree completion. Research reveals that the following factors contribute to students' satisfaction: (a) perceived fulfillment of students' expectations, (b) quality of
the program, (c) fairness of requirements, (d) consistency in the evaluation of students, (e) faculty communications with students, (f) faculty concern for students as professionals, and (g) faculty guidance.

7. Peer interaction is related to persistence. Doctoral degree completers are more likely to be involved with their academic peers than are non-completers. However, research reveals that while student-to-student relationships are important for student persistence, they do not play as prominent a role as do student-to-faculty relationships.

8. Doctoral programs that have smaller entering cohorts generally have lower time-to-degree and higher completion rates than programs with larger entering cohorts.

9. Low student morale due to poor employment prospects in the academic profession negatively impacts completion rates.

Attrition and Time-to-Degree in Texas:

The following chart illustrates the ten-year completion rates of students in Texas doctoral programs by discipline for three student cohorts.

<table>
<thead>
<tr>
<th>Discipline</th>
<th>1990</th>
<th>1991</th>
<th>1992</th>
<th>Total Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>8%</td>
<td>4%</td>
<td>9%</td>
<td>530</td>
</tr>
<tr>
<td>Edu</td>
<td>15%</td>
<td>9%</td>
<td>11%</td>
<td>1,859</td>
</tr>
<tr>
<td>Eng</td>
<td>26%</td>
<td>19%</td>
<td>21%</td>
<td>1,473</td>
</tr>
<tr>
<td>Health</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>575</td>
</tr>
<tr>
<td>Sci &amp; Math</td>
<td>69%</td>
<td>50%</td>
<td>56%</td>
<td>1,120</td>
</tr>
<tr>
<td>Soc Sci &amp; Serv</td>
<td>48%</td>
<td>56%</td>
<td>58%</td>
<td>459</td>
</tr>
<tr>
<td>Agri &amp; Other</td>
<td>38%</td>
<td>27%</td>
<td>22%</td>
<td>247</td>
</tr>
<tr>
<td>Avg. for all Disciplines</td>
<td>46%</td>
<td>40%</td>
<td>43%</td>
<td>2,608</td>
</tr>
</tbody>
</table>

Note: See Appendix E for a list of Classification of Instructional Program (CIP) Codes.

Note: See Appendix F for a description of the data analysis methodology used for the data depicted in the charts in this section.
At the institutional level, significant differences in doctoral completion rates are evident.

### Completion Rates* of Doctoral Degrees in Texas by University

(Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>University</th>
<th>Master's Only</th>
<th>Doctorate</th>
<th>No Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamar University</td>
<td>69%</td>
<td>5%</td>
<td>26%</td>
</tr>
<tr>
<td>Sam Houston State University</td>
<td>67%</td>
<td>5%</td>
<td>28%</td>
</tr>
<tr>
<td>Stephen F. Austin State University</td>
<td>66%</td>
<td>5%</td>
<td>29%</td>
</tr>
<tr>
<td>Texas A&amp;M University - Commerce</td>
<td>66%</td>
<td>6%</td>
<td>28%</td>
</tr>
<tr>
<td>Texas A&amp;M University - Kingsville</td>
<td>67%</td>
<td>6%</td>
<td>27%</td>
</tr>
<tr>
<td>Texas Tech University</td>
<td>65%</td>
<td>6%</td>
<td>30%</td>
</tr>
<tr>
<td>Texas Woman's University</td>
<td>62%</td>
<td>6%</td>
<td>32%</td>
</tr>
<tr>
<td>Univ. of North Texas</td>
<td>64%</td>
<td>2%</td>
<td>34%</td>
</tr>
<tr>
<td>UT at Austin</td>
<td>63%</td>
<td>5%</td>
<td>27%</td>
</tr>
<tr>
<td>UT at Dallas</td>
<td>63%</td>
<td>6%</td>
<td>28%</td>
</tr>
<tr>
<td>UT at El Paso</td>
<td>68%</td>
<td>5%</td>
<td>27%</td>
</tr>
<tr>
<td>Avg for Universities</td>
<td>67%</td>
<td>5%</td>
<td>28%</td>
</tr>
</tbody>
</table>

**Total Students:** 1,713

* Each cohort tracked for ten years.

**Sources:** Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

---

### Completion Rates* of Doctoral Degrees in Texas by Health Science Center

(Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>Health Science Center</th>
<th>Master's Only</th>
<th>Doctorate</th>
<th>No Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baylor College of Medicine</td>
<td>63%</td>
<td>5%</td>
<td>31%</td>
</tr>
<tr>
<td>Texas A&amp;M HSC</td>
<td>69%</td>
<td>5%</td>
<td>26%</td>
</tr>
<tr>
<td>Texas Tech HSC</td>
<td>64%</td>
<td>6%</td>
<td>29%</td>
</tr>
<tr>
<td>UT HSC Houston</td>
<td>70%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>UT HSC San Antonio</td>
<td>67%</td>
<td>5%</td>
<td>28%</td>
</tr>
<tr>
<td>UT Southwestern Medical Center</td>
<td>67%</td>
<td>5%</td>
<td>30%</td>
</tr>
<tr>
<td>UTMB Galveston</td>
<td>66%</td>
<td>5%</td>
<td>32%</td>
</tr>
<tr>
<td>Avg for HSCs</td>
<td>69%</td>
<td>5%</td>
<td>26%</td>
</tr>
</tbody>
</table>

**Total Students:** 1,105

* Each cohort tracked for ten years.

**Sources:** Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

**Note:** As indicated in the text, completion rates vary significantly by academic discipline. See Appendices G - H for further analyses.
Registered time-to-degree (RTD) takes into consideration only the time for which the student was registered as a doctoral (not master’s) student, excluding any semesters taken off during study. The following chart illustrates that the RTD for students in Texas doctoral programs differs by discipline. Doctoral students in Engineering had the shortest RTD; doctoral students in Psychology had the longest.

**Registered Time to Doctoral Degrees in Texas by Discipline & CIP Codes (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)**

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>Total Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business (B 02)</td>
<td>1,433</td>
</tr>
<tr>
<td>Education (13)</td>
<td>411</td>
</tr>
<tr>
<td>Engineering (14,41)</td>
<td>316</td>
</tr>
<tr>
<td>Health (61)</td>
<td>179</td>
</tr>
<tr>
<td>Lib, Fine Arts, Arch (*)</td>
<td>179</td>
</tr>
<tr>
<td>Psychology (42)</td>
<td>179</td>
</tr>
<tr>
<td>Sci &amp; Math (31, 26, 7, 90)</td>
<td>179</td>
</tr>
<tr>
<td>Soc. &amp; Serv (19, 20, 3, 45)</td>
<td>179</td>
</tr>
<tr>
<td>Agr &amp; Other (1, 2, 99)</td>
<td>179</td>
</tr>
</tbody>
</table>

* Average number of semesters are weighted averages, based on doctoral graduates who began in fall 1990, fall 1991, or fall 1992.

** “Liberal Arts, Fine Arts, and Architecture” includes CIP Codes 4, 5, 9, 16, 23, 24, 25, 30, 38, and 50.

Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

**Note:** Registered time-to-degree includes two full semesters and one summer session, so dividing the number of semesters by three will yield registered time-to-degree in years.
At the institutional level, notable differences in RTD are apparent.

### Semesters of Doctoral Enrollment for Recipients of Doctoral Degrees in Texas by University (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>University</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamar University</td>
<td>11.6</td>
</tr>
<tr>
<td>Sam Houston State University</td>
<td>12.2</td>
</tr>
<tr>
<td>Stephen F. Austin State University</td>
<td>11.9</td>
</tr>
<tr>
<td>Texas A&amp;M - Commerce</td>
<td>12.9</td>
</tr>
<tr>
<td>Texas A&amp;M - Kingsville</td>
<td>13.9</td>
</tr>
<tr>
<td>Texas Tech University</td>
<td>12.6</td>
</tr>
<tr>
<td>Texas Woman's University</td>
<td>12.0</td>
</tr>
<tr>
<td>UT Southwestern Medical Center</td>
<td>14.5</td>
</tr>
<tr>
<td>UT at El Paso</td>
<td>13.9</td>
</tr>
</tbody>
</table>

* Average number of semesters are weighted averages, based on doctoral graduates who began in fall 1990, fall 1991, or fall 1992.

Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

### Semesters of Doctoral Enrollment for Recipients of Doctoral Degrees in Texas by Health Science Center (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>Health Science Center</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baylor College of Medicine</td>
<td>14.8</td>
</tr>
<tr>
<td>Texas A&amp;M HSC</td>
<td>8.5</td>
</tr>
<tr>
<td>Texas Tech HSC</td>
<td>15.1</td>
</tr>
<tr>
<td>UT HSC Houston</td>
<td>13.2</td>
</tr>
<tr>
<td>UT HSC San Antonio</td>
<td>16.3</td>
</tr>
<tr>
<td>UT Southwestern Medical Center</td>
<td>17.9</td>
</tr>
<tr>
<td>UTMB Galveston</td>
<td>16.3</td>
</tr>
</tbody>
</table>

* Average number of semesters are weighted averages, based on doctoral graduates who began in fall 1990, fall 1991, or fall 1992.

Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

Note: Time-to-degree varies significantly by academic discipline. See Appendices I - J for further analyses.
Recommendations and Rationale

Based on staff analysis of factors which have been shown to positively influence student persistence and reduce their time-to-degree, encourage institutions to implement some of the following strategies (listed in order of apparent effectiveness).

1. Provide competitive student financial support for doctoral students in the form of fellowships, research assistantships, and teaching assistantships. Departments should be encouraged not to allocate all their funds for fellowships to attract new students, but to reserve a portion for students at later stages of the degree program. If possible, it is advisable to guarantee four years of financial support for doctoral students (assuming appropriate academic progress). Traditionally available sources of support include:
   - Research assistantships provided by federal and industrial contracts and grants
   - Teaching assistantships funded through earned state formula funding
   - Fellowships or grants funded by increased fee revenue from enrollment growth
   - University partnerships with federal and state governments, industry, foundations, and private donors

2. Provide adequate advising and mentoring for doctoral students. Department heads should not assume that faculty members are capable and attentive mentors.
   - Provide written guidelines for mentors and adequate preparation for mentoring by graduate faculty, based on research about effective mentoring practices.
   - Provide students the opportunity to work with multiple mentors.
   - Hold faculty members accountable for better advising by explicitly including advising as a faculty responsibility and by evaluating professors on their advising along with their research and teaching.
   - Provide organized, institutionalized opportunities for reflection and feedback among graduate students and faculty mentors about important developmental issues, career goals, and other issues.

3. Provide explicit expectations for doctoral students at the departmental level.
   - Make transparent to graduate students the selection processes; the expected progress to the degree; methods of assessment/evaluation; and comprehensive data on placement, time-to-degree, and program completion rates.
   - Foster and support graduate student access to information as well as make explicit all expectations and norms.
• Conduct focus groups and exit interviews to determine match with expectations, especially with any non-completers.

• Track the progress of doctoral students, candidates, and graduates to assess satisfaction with their experience and better understand their professional career paths.

4. Implement specific activities at the institutional, departmental, and individual levels that are designed to increase completion rates. Within the University of California System, a comprehensive study and subsequent efforts to reduce time-to-degree and increase doctoral student graduation rates indicate that the following specific activities have yielded positive results:

• Orientation programs

• Peer-support groups

• Grant proposal writing workshops

• Topical interdisciplinary dissertation workshops

• Dissertation writing workshops

• Dissertations-in-progress abstract database with author’s contact information (database of dissertations in progress, accessible from a university library Web page, and searchable by doctoral students)

• Academic publishing workshop and academic publishing guide

5. Balance the deep learning of the disciplinary doctorate with the variety of interdisciplinary challenges.

• Provide more opportunities for students to work with one another across disciplinary lines through dissertation retreats, interdisciplinary retreat programs, and other activities.

• Encourage graduate students to work with more than one mentor in different disciplines.

• Develop inter-disciplinary, multi-disciplinary, cross-disciplinary programs.

Rationale:

Although clear cause and effect linkages are difficult to establish, these recommendations are based on the extensive research on factors influencing attrition, persistence, and time-to-degree which have been reported across multiple institutions and disciplines and which have been shown to positively influence student persistence and reduce their time-to-degree. Particularly notable sources
are the following: (a) recommendations from national studies on doctoral education by Jody Nyquist and Donald H. Wulff, 2000; (b) recommendations by The Commission on the Growth and Support of Graduate Education, The University of California, September 2001; (c) recommendations of The University of California Council of Graduate Deans, 2003; and (d) two academic articles by Maresi Nerad and Debra Sands Miller, 1996 and 1997 regarding The University of California at Berkeley’s efforts to increase doctoral student graduation rates and decrease their time-to-degree (see Appendix K).

F. Research Funding

Key Question:

1. Do doctoral programs implemented in the last 10 years align with federal research funding availability?

Background:

As indicated in Part 1 of the study (pages 44-45), federal research funding for institutions represents outside revenue that is used for several aspects of institutional operations and doctoral programs (e.g., salaries, equipment, scholarships) and constitutes a forward-looking investment that seeks to create new knowledge and innovative discoveries. Because of the close association between research funding and doctoral programs, the Coordinating Board staff examined whether new doctoral programs approved in the last 10 years (1994-2003) were associated with fields in which significant federal research dollars were available. Over this 10 year period, there were 106 research-oriented doctorates created in Texas public institutions (85 in universities, 21 in health-related institutions). These new programs are grouped by general discipline in the following table:

<table>
<thead>
<tr>
<th>Discipline Area</th>
<th>Texas Public Doctoral Programs Started 1994-2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>18</td>
</tr>
<tr>
<td>Clinical Science</td>
<td>16</td>
</tr>
<tr>
<td>Education</td>
<td>14</td>
</tr>
<tr>
<td>Bio/Med Science</td>
<td>10</td>
</tr>
<tr>
<td>Social Science</td>
<td>7</td>
</tr>
<tr>
<td>Business</td>
<td>7</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>5</td>
</tr>
<tr>
<td>Literature</td>
<td>5</td>
</tr>
<tr>
<td>Psychology</td>
<td>4</td>
</tr>
<tr>
<td>Arts</td>
<td>4</td>
</tr>
</tbody>
</table>

Disciplines in which fewer than four programs were started are not shown.
Over the last 10 years, a moderately strong relationship exists between programs started (see above) and available federal research funding. Federal research funding in the U.S. and in Texas has remained quite stable across discipline areas over the past ten years. Although results would vary by year, an analysis based on 2002 federal funding is generally typical and is shown in the following table.

<table>
<thead>
<tr>
<th>Discipline/ CIP Code</th>
<th>2002 Federal Research Funds (Millions)</th>
<th>2002 Texas Research Funds at Texas Public Institutions (Millions)</th>
<th>Texas’ Percentage of Available Federal Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Science* (51)</td>
<td>$7,230.5</td>
<td>$401.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Biological Science* (26)</td>
<td>4,406.3</td>
<td>260.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Engineering (14)</td>
<td>3,217.3</td>
<td>155.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Physical Science (40)</td>
<td>2,124.1</td>
<td>79.9</td>
<td>3.8</td>
</tr>
<tr>
<td>Environmental Science (03)</td>
<td>1,293.6</td>
<td>91.7</td>
<td>7.1</td>
</tr>
<tr>
<td>Computer Science (11)</td>
<td>769.8</td>
<td>31.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Agricultural Science (01)</td>
<td>685.7</td>
<td>25.4</td>
<td>3.7</td>
</tr>
<tr>
<td>Education (13)</td>
<td>625.2</td>
<td>24.3</td>
<td>3.9</td>
</tr>
<tr>
<td>Social Science (45)</td>
<td>616.2</td>
<td>13.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Psychology (42)</td>
<td>474.4</td>
<td>15.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Mathematical Science (27)</td>
<td>266.8</td>
<td>26.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Others</td>
<td>Not available</td>
<td>16.4</td>
<td>Not available</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$1,142.3</td>
<td>Not available</td>
</tr>
</tbody>
</table>

*Research funding also associated with professional degrees (e.g., MD, DO, DVM, DDS, RN)

Statistically, correlations of .70 (between frequency and U.S. funding) and .64 (between frequency and Texas funding) were obtained. The table also shows (for each discipline area) the percentage of research funds obtained by Texas public institutions out of the total federal funds awarded for the area. These percentages are useful when compared against the percentage of doctoral graduates at Texas public institutions out of the total U.S. doctoral graduates for each discipline as seen below:
A partial proxy for estimating the effectiveness of Texas’ doctoral programs in securing federal research funding can be reached by combining these two sets of percentages (Texas research funding/federal research funding and Texas doctoral graduates/U.S. doctoral graduates) as observed in the following bar graph.
Comparison of Texas' Percentage of U.S. Doctoral Graduates and Texas' Percentage of U.S. Research Funding by Discipline Area (2002)

For example, a discipline for which Texas is producing a high percentage of the nation’s graduates but receiving a significantly smaller percentage of federal research funds could suggest there is little need (at least by this measure) for more doctoral programs in the discipline in the state. Rather than add to the already significant number of doctoral students in the discipline, existing programs need to be more effective at securing more federal funding.

Conversely, if Texas shows a very small percentage of U.S. graduates in a discipline and a small percentage of research funds garnered by the state’s institutions, then the discipline could present opportunities for doctoral program growth in the state and additional federal funding.

Recommendation and Rationale:

1. While recognizing that some important and worthy disciplines are afforded minimal opportunities for federal funding, to address the research goal of *Closing the Gaps*, the state should especially support doctoral programs that have potential for garnering significant federal research monies or otherwise bring benefits to the state.
Rationale:

The data presented above can be useful in targeting potential growth in doctoral programs that could bring more federal research dollars to the state. Of course, this measure would be just one of many criteria in considering the need for new programs. In addition, while there is a strong relationship between doctoral programs and the ability to attract federal research funds, there are clearly a number of non-doctoral programs that obtain research monies. Staff also acknowledges that the number of doctoral graduates in a program is only a rough proxy for "expected research funding." It is the number of faculty that is a more direct correlate of expected funding, but figures for faculty are not available on a national basis. And there are many other factors affecting funding as well. However, even with the acknowledged limitations, this data can be a useful planning tool for institutions and the state.

Conclusion:

Doctoral education provides critical needs for Texas and the nation. It is also expensive and competes with many other higher education needs in the state. Therefore, the Board and higher education institutions must ensure that the state promotes the growth of doctoral programs in the best and most cost-efficient means possible.

The two parts of this report have raised several critical issues and questions concerning doctoral education. The staff believe the recommendations in the second part of the report are important and significant means to address these issues and to enhance the effectiveness of doctoral education in the state.

Before implementing these recommendations, the staff will appoint a standing committee on graduate education that has broad institutional representation. The committee will advise and assist the staff in: 1) developing procedures to implement the recommendations in the report, 2) evaluating the success of implementation, and 3) making suggestions for future directions the Board and institutions should take to enhance graduate and, especially, doctoral education in Texas.

The committee will include representation from public universities, public health-related institutions, and independent institutions. In addition, diversity will be ensured on the committee, with balanced representation from institutions in different regions of the state, from system and non-system schools, doctoral and non-doctoral granting institutions, large and small institutions, and minority-serving institutions.
References

Doctoral Education in Texas, Part 2: Recommendations to the State

Texas Higher Education Coordinating Board
October 2004
References - Diversity


Ellis, Evelynn M. “Race, Gender and the Graduate Student Experience: Recent Research.” Diversity in Higher Education website. www.diversityweb.org.


The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. http://was.nd.edu/gem/gemwebapp/gem_00_000.htm


The Preparing Future Faculty Program. http://www.preparing-faculty.org/


The Association of International Educators (NASFA). http://www.nafsa.org
United Negro College Fund. www.uncf.org

The U.S. Department of Education. www.ed.gov
References – Completion Rates and Time-to-Degree


APPENDICES

Appendix A - K

Doctoral Education in Texas, Part 2: Recommendations to the State
Appendix A

National Awards for Promoting Inclusive Graduate Communities

The Council of Graduate Schools/Peterson’s Award for Promoting an Inclusive Graduate Community is given annually to institutions that develop and implement innovative, creative approaches to enhancing the graduate experience by identifying, recruiting, retaining, and graduating minority graduate students. The following is a list of recent award recipients and some of the various initiatives currently in practice at these institutions. Administrators and faculty at Texas institutions are encouraged to learn more about these and other similar programs.

The University of Mississippi (2003 award winner) has a comprehensive program to recruit and retain underrepresented students that includes a writing assistance program for international students, annual social and cultural activities, a mentorship program that puts “graduate ambassadors” together with new graduate students to help facilitate the transition into graduate school, and a series of luncheon discussion meetings that bring students and faculty together regularly. In addition, the institution works with other national and state-wide initiatives including the Ronald E. McNair Post-Baccalaureate Achievement Program, The Alliance for Graduate Education in Mississippi, the Biomedical Research Internship program, and the Short-Term Training for Minority Students program. Some of these programs offer financial support while others, targeting specific groups such as science students, provide research and internship opportunities. The institution reports that minority graduate enrollment was approximately 2 percent of the total graduate enrollment in 1990 and has risen to about 15 percent. Completion rates for minority graduate students are as high as they are for non-minority students. Additionally, the percentage of African-American students completing Ph.D.’s is equivalent to the percentage of African-American students enrolled in the graduate school; so attrition rates appear to be low (or stable).

The University of Maryland, Baltimore County (2002 award winner) focuses its efforts on developing better mentorship relationships between faculty and graduate students in an attempt to reduce the attrition rates of minority doctoral students. Its efforts are particularly targeting those fields in which women and minorities have been historically underrepresented, such as science, math, engineering, and technology. In addition, a sizeable grant from the National Science Foundation in the amount of $2.5 million was obtained by the institution to create PROMISE, Maryland’s Alliance for Graduate Education and the Professoriate, which established a consortium of various universities. This program focuses on recruitment, mentoring, and professional development. The program includes retreats, seminars, conferences, peer mentoring, and other community building and professional development initiatives. Students in the program can also teach courses in partnership with the McNair Scholars program and the Howard University Electrical and Computer Engineering Department. Furthermore, the Meyerhoff Graduate Fellows Program in the Biomedical Sciences supports minority students by providing financial stipends, a summer research program, monthly discussion groups and annual retreats with faculty and other students, and mentoring. Since 1996 the institution reports significant increases in applications, enrollments, and retention of minority students particularly in STEM fields. The overall retention rate is reported to be 74 percent.
Appendix A
Page 2

The Graduate School at the University of Missouri-Columbia (2001 award winner) includes a variety of programs aimed at increasing diversity. The Louis Stokes Missouri Alliance for Minority Participation is designed to increase the number of doctoral graduates in science, mathematics, engineering, and technology through a broad range of initiatives including mentoring, collaborative learning sessions, GRE prep courses, scholarships, summer research seminars, and many other funded programs. The institution also participates in the Alliance for Graduate Education and the Professoriate program, the Ronald E. McNair Post-Baccalaureate Achievement Program, and the Preparing Future Faculty Program. In addition, the Multicultural Teaching Scholars Program exposes undergraduate and graduate students to a more diverse faculty by hiring recent minority doctoral graduates or those nearing completion to teach or co-teach a course during a summer session.

The University of Georgia won the award in 2000. Among the efforts being developed and implemented through the office of recruitment and retention in the graduate school are the following: a series of workshops designed to increase faculty involvement in creating a climate of inclusiveness, the development of a faculty-oriented handbook of “best practices” in recruiting a diverse graduate student body, recognition and reward for faculty involvement in creating an inclusive graduate program, the development of a program that allows undergraduates from underrepresented groups to engage in research opportunities with faculty, the development of recruitment fairs and campus visits, the collaboration with regional and state institutions to create feeder programs that channel selected students into doctoral programs, and the organization of monthly mixers for graduate students, faculty, and local professionals. The office of recruitment and retention does not currently track students through graduation.

SUNY at Stony Brook University (1999 award winner) has developed a diversity program that includes the integration of a variety of initiatives aimed at developing and maintaining a climate of inclusiveness on campus. With the creation of an upper-level administrative position, the associate dean for underrepresented student affairs, came the development of several related programs. The Post-Doctoral Diversity Program allows recent graduates to gain professional development experience within the academic environment while increasing diversity at the institution. The Presidential Lecture Series brings to campus nationally renowned speakers and scholars of color. The President’s Award for Excellence in Diversity and Affirmative Action recognizes individuals who have made outstanding contributions to the advancement of equal opportunity and affirmative action at the institution. Recognized accomplishments include improving the University's working, learning, and teaching environments as they affect diverse populations. In addition, the institution participates in the Louis Stokes Alliance for Minority Participation program, has a summer research institute for undergraduates, invites potential graduate students to campus visits, and other programs designed to increase participation of underrepresented groups.
Appendix B

National Programs and Initiatives to Support Black and Hispanic Graduate Students

A number of national resources are available to attract, retain, and graduate underrepresented minorities in doctoral programs. Many Texas institutions have already well-established relationships with some of these organizations. The following are brief descriptions of some of these programs and initiatives:

The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) whose goal is to increase the number of American Indian, African American, Latino, Puerto Rican, and other Hispanic Americans, offers fellowships to students pursuing graduate degrees in engineering, physical science and natural science disciplines. The fellows can also obtain practical work experience through summer internships at GEM Employer worksites. In addition to offering fellowships, GEM creates publications and videos for graduate, undergraduate, and pre-college students. GEM also provides courses to prepare undergraduates to succeed in graduate coursework and guidance to graduate-level students on how to be successful in doctoral research programs.

The Council of Graduate Schools, an organization of institutions of higher education whose mission is to improve and advance graduate education, is currently reviewing grants specifically targeted at creating intervention strategies for doctoral students in science, engineering, and mathematics (SEM) and evaluating the effects of these strategies on attrition and completion rates. The goal is to increase Ph.D. completion and to provide models for best practice that can be used nationwide, including strategies that help to improve completion rates among minorities and women.

The Preparing Future Faculty (PFF) program, initiated in 1993 as a partnership between the Council of Graduate Schools and the Association of American Colleges and Universities, is a program developed to change the way future faculty members are prepared for their careers. These programs provide doctoral students, as well as some master's and postdoctoral students, with opportunities to observe and experience faculty responsibilities at a variety of educational institutions with varying missions, diverse student populations, and different faculty expectations. Between 1993-2003, PFF programs were implemented at more than 45 doctoral degree-granting institutions and nearly 300 "partner" institutions in the United States. While the grant periods have ended, the Council of Graduate Schools continues to provide administrative support to existing programs and to those interested in developing new PFF programs. Many institutions involved in these programs have distinct missions and constituencies. In particular, there are 16 historically black colleges and universities (HBCUs), 23 Hispanic-serving institutions (HSIs), 10 women's colleges, and 4 tribal colleges. The following Texas institutions are currently involved in PFF programs: Huston-Tillotson College, Prairie View A&M University, Texas Southern University, Our Lady of the Lake University, St. Edward’s University, Texas A&M International University, Texas A&M University-Kingsville, and The University of Texas-Pan American.

The Integrative Graduate Education and Research Traineeship (IGERT) program, initiated in 1997 by the National Science Foundation (NSF), has been developed to meet
the needs of Ph.D. scientists, engineers, and educators with research and education interests that are primarily interdisciplinary. The program is intended to establish new models for graduate education and training in research activities that transcend traditional disciplinary boundaries. It is also intended to facilitate greater diversity in student participation and preparation and to contribute to the development of a diverse, globally-engaged science and engineering workforce. Proposals submitted to the IGERT program must be integrative, research-based, graduate education and training activities in emerging areas of science and engineering. The project should be organized around an interdisciplinary theme. Students should gain a breadth of skills and understanding to work in an interdisciplinary environment while being well grounded with depth of knowledge in a major field. The project should provide students with experience relevant to both academic and nonacademic careers. This may involve such activities as internships and mentoring in industrial, national laboratory, academic, or other settings.

The Alliances for Graduate Education and the Professoriate (AGEP) program seeks to increase the number of African-American, Hispanic and American Indian/Alaskan Native (Native American) students receiving doctoral degrees in all disciplines funded by the National Science Foundation (NSF). The association believes that the scarcity of role models and mentors in the professoriate constitutes a significant barrier to producing minority graduates; NSF is, therefore, interested in increasing the number of minorities in the professoriate. Specific objectives of the AGEP Program are to develop models for recruiting, mentoring, and retaining minority students in doctoral programs and to develop effective strategies for identifying and supporting underrepresented minorities who want to pursue academic careers. The AGEP program also supports research aimed at identifying major factors that promote successful transition of minority students from undergraduate through graduate study, from graduate course-taking to independent research required for the dissertation, and from the academic environment to the workplace.

The National Science and Technology Council focuses on women and minorities' participation in STEM fields in an effort to increase the representation of these groups in the U.S. workforce. The Center for the Integration of Research, Teaching and Learning (CIRTL) Diversity Institute brings together educators and scholars to produce materials and resources that are intended to improve STEM higher education based on the idea that student learning is enhanced when classes, laboratories, and discussion sections cultivate participation and engagement of all students irrespective of race, gender, or socioeconomic background. In particular, the goal of the Diversity Institute is to create and disseminate resources that will enable faculty and future faculty to enhance diversity in STEM fields by creating inclusive classrooms. Faculty and students bring a variety of experiences, backgrounds, and skills to the teaching and learning process. The main principles adopted by the organization include promoting interaction among scholars that connects research to current issues and integrates contributions made by women and underrepresented minorities to science into course content, develops an inclusive climate in which educators draw on the experiences of students from a variety of backgrounds, and creates equitable teaching environments through deliberate efforts on the part of educators who are encouraged to monitor examples, language, and student interactions to ensure an atmosphere of inclusion.
The Ronald E. McNair Postbaccalaureate Achievement program awards grants to institutions for projects designed to prepare participants from disadvantaged backgrounds and with strong academic potential for doctoral study through involvement in research and other scholarly activities. The primary goal of the program is to increase the attainment of the Ph.D. by students from underrepresented segments of society. Institutions work closely with participants through their undergraduate work, encourage their entrance into graduate programs, and track their progress to successful completion of advanced degrees. Some of the services provided by the program include making research opportunities available to students at the undergraduate level, mentoring, seminars and other scholarly activities, summer internships, tutoring, academic counseling, assistance in obtaining financial aid, and assistance in securing admission into graduate programs.

The Louis Stokes Alliance for Minority Participation (LSAMP) program is designed to develop strategies necessary to strengthen the preparation of and increase the number of minority students who complete baccalaureates in STEM fields. This objective is intended to lay the groundwork for the long-term goal of increasing the production of Ph.D.s in STEM fields, with a particular emphasis on promoting entry into faculty positions. The LSAMP program requires each awardee to establish partnerships among academic institutions as well as government agencies and laboratories, industry, and professional organizations. The kinds of activities these partnerships are encouraged to develop include student enrichment programs such as collaborative learning and mentoring, academic enrichment programs such as curricular and instructional improvement, and direct student support such as summer activities.

Since 1995, The Alfred P. Sloan Foundation's Minority Ph.D. Program, administered by The National Action Council for Minorities in Engineering (NACME), offers scholarship support to underrepresented minority students who are beginning their doctoral work in engineering, natural science, and mathematics. The faculty members and departments participating in the Alfred P. Sloan Minority Ph.D. Program were selected because they have demonstrated a commitment to educating African American, American Indian and Latino leaders. Each has a track record of preparing women and men from historically underrepresented groups for leadership in engineering, technology, and math- and science-based disciplines. Sloan and the departments work together to guarantee students financial support, mentoring, and guidance as long as they are making satisfactory progress toward the degree. Texas institutions engaged in this program include Rice University, Texas A&M University, The University of Texas at Austin, and The University of Texas at San Antonio. The program also produces a written guide to faculty and administrators for the successful recruitment of minority students into science and engineering Ph.D. programs.

The United Negro College Fund (UNCF)'s primary goal is to enhance the quality of higher education by providing financial assistance to deserving students. It provides more than 450 grants, scholarships, and fellowships to assist both undergraduate and graduate students every year. One such program, the Gates Millennium Scholars program, can support a student from undergraduate school through his or her doctoral education. In addition, the UNCF website lists thousands of scholarships and grants
administered by other organizations. The database can be searched alphabetically, geographically, and by discipline or major.

**Research**

With the support of The Atlantic Philanthropies and The Andrew W. Mellon Foundation, the Woodrow Wilson National Fellowship Foundation’s Responsive Ph.D. is currently investigating major support programs for minorities pursuing graduate education. The mission is to examine existing, national support programs, both public and private, to learn more about the outcomes of different support structures, including institution-based vs. individual-based programs, need-based aid vs. programs specifically targeted to minority students, intervention vs. pure funding models, and liberal arts vs. discipline-specific programs. The project will then produce a report that provides an outline of the existing programs describing their goals, achievements, and potential strengths and weaknesses. The findings will provide an agenda for a future conference on the effectiveness of current strategies and on the potential for common action.
Appendix C

Efforts by Texas Institutions to Increase Diversity in Doctoral Education

A review of the graduate school websites for Texas public universities yielded the following information regarding the state’s current efforts to increase diversity in doctoral programs. This list may not represent all of the activities being carried out in Texas with respect to this issue. In addition, as stated before, many Texas institutions have already established relationships with some of the national organizations described above that promote diversity in graduate education.

General findings:

- Many institutions state a commitment to identify, recruit, and retain students with high potential for academic success who are from groups historically underrepresented in higher education.

- Some institutions include a statement in their strategic plans about increasing the number of minority faculty.

- Many institutions provide resources to assist international graduate students in their acclimation to the U.S. academic environment.

- Many institutions list on their websites financial aid resources for minority students, including those for women, African Americans, and Hispanic Americans.

- Some institutions have campus organizations specifically to support minority students in graduate programs, for instance, the Black Graduate Student Association and the Graduate Women in Business group.

- Some institutions’ student government associations have developed programs to recognize and promote the diversity of the graduate students at the institution.

- Some institutions have developed workshops and handbooks to train faculty and administrators on how to better receive students from underrepresented populations, how to create a more inclusive departmental or program environment, and how to create a more inclusive classroom learning environment.

- Some institutions have developed workshops and handbooks for undergraduate students on how to prepare for graduate school.

- Some institutions provide incentives to graduate programs that develop proposals for participation in national initiatives to increase graduate student diversity.

- Some institutions partner with other state institutions, especially the Hispanic-serving and historically black institutions, to funnel prospective students into appropriate graduate programs.
• Some institutions encourage and provide incentives for the emulation of diversity pipeline programs developed in other states and regions.

• Some institutions have plans to invite alumni who have earned doctorates at other institutions to return to teach, conduct research, and mentor minority graduate students.

• Some institutions involve students and faculty in workshops and conferences addressing the issue of diversity.

• Some institutions support networking through regular social and professional activities.

• Some institutions establish summer teaching and research programs to support and develop minority students.

• Some institutions are developing internship opportunities for undergraduates to engage in research activities.

• Some institutions perform assessment of their diversity initiatives by reviewing enrollment patterns and the number of special teaching, research, mentorship, and other programs that have been developed.

**Targeted Fellowships**

In addition to the specific activities designed to promote diversity in graduate education, many Texas institutions list resources and targeted fellowships available to students from underrepresented groups. The following is a list of many of those resources:

• The Albert W. Dent Graduate Student Scholarship (healthcare management)

• American Association of University Women Educational Foundation

• American Dental Association Foundation

• American Educational Research Association (AERA): Minority Fellowship Program

• American Geological Institute Minority Participation Program

• American Indian Graduate Center (AIGC): Academic Year Fellowship

• American Indian Science and Engineering Society (AISES)

• American Institute of Certified Public Accountants

• American Physiological Society Minority Awards
• American Planning Association Fellowship Program
• American Political Science Association Minority Fellows Program
• American Psychological Association Minority Fellowship Program
• American Society for Microbiology
• American Sociological Association Minority Fellowship Program
• AT&T Labs Fellowship Program
• CIRI Foundation Scholarship Program: Special Excellence Scholarships
• Congressional Black Caucus Foundation, Inc
• Congressional Hispanic Caucus Institute Fellowship Program
• Cooper-Hewitt National Design Museum (Smithsonian Institution): Kell-Muñoz Education Fellowship
• Department of Energy, Global Change Education Project, (GCEP): Graduate Research Environmental Fellowships
• Ford Foundation Fellowships for Minorities
• The Gates Millennium Scholars Program
• G.E. Foundation: Faculty for the Future Program
• GEM Consortium
• Government Finance Officers Association
• Graduate Education for Minorities MS Engineering Fellowship Program
• Graduate Education for Minorities Ph.D. Program in Engineering
• Graduate Education for Minorities Ph.D. Program in Science
• Hispanic Association of Colleges & Universities Scholarship Programs
• Hispanic Scholarship Fund - HSF/Pfizer Inc. Fellowship Program
• Hispanic Scholarship Fund - National Hispanic Foundation for the Arts 2004-2005 Entertainment Arts & Industry Scholarship Program

• Hispanic Scholarship Fund - National Society of Hispanic MBAs Scholarship 2003-2004 Program

• Howard Hughes Medical Institute (HHMI): Predoctoral Fellowships in the Biological Sciences

• Institute for the Study of World Politics: Dorothy Danforth Compton Fellowships for Dissertation Work

• Korean-American Scholarship Foundation (KASF): KASF Scholarships

• League of United Latin American Citizens

• Lucent Technologies: Bell Labs Graduate Research Fellowship Program

• Mathematical Policy Research, Inc.: Summer Fellowships

• Mexican American Legal Defense & Education Fund

• Minority Medical Education Program

• NASA/Harriet g. Jenkins Predoctoral Fellowship Fund

• National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM): Graduate Fellowship Programs

• National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE): African-American Graduate Fellowships

• National Physical Science Consortium (NPSC): Graduate Fellowships in the Physical Sciences

• Newberry Library (D'Arcy McNickle Center for the History of the American Indian): Frances C. Allen Fellowships

• NOAA/ U.S. Department of Commerce: The Dr. Nancy Foster Scholarship Program

• Oak Ridge Institute for Science and Education (ORISE)/ U.S. Nuclear Regulatory Commission Historically Black Colleges and Universities: Student Research Participation

• The Ph.D. Project
• Robert Bosch Foundation Fellowship Program

• Smithsonian Center for Latino Initiatives (SCLI) (Smithsonian Institution): Latino Studies Predoctoral Fellowships

• Smithsonian Institution, Office of Fellowships (Various awards)

• Society for Advancement of Chicanos and Native Americans in Science

• Society of Mexican American Engineers and Scientists 2003-2004 National Scholarship Program

• Solomon R. Guggenheim Museum: Summer Internship for Diversity in the Museum Profession

• SREB Minority Doctoral Scholars Program

• Sylvia Taylor Johnson Minority Fellowship in Educational Measurement

• Texas Opportunity Graduate Fellowship

• United Negro College Fund - Merck Graduate Science Research Dissertation Fellowships

• United Negro College Fund - Pfizer Biomedical Research Initiative

• U.S. Department of Health and Human Services (NIH), Agency for Healthcare Research and Quality (AHRQ): Predoctoral Fellowship Awards for Minority Students

• USA Funds: Access to Education Scholarships

• Women in Defense

• William Randolph Hearst Endowed Scholarship for Minority Students

• Xerox Corporation: Xerox Technical Minority Scholarships
Appendix D

Texas’ Two Historically Black Public Institutions

In collaboration with the Office of Civil Rights within the U.S. Department of Education, Texas’s two public historically black institutions have created priority plans to strengthen the overall education of students at these schools. These documents include specific plans to improve existing degree programs and to develop new ones; to build and/or upgrade facilities; to maintain or obtain accreditation for specific programs; to create and/or expand academic and administrative support systems; to hire a number of endowed chairs; to create merit-based scholarship programs; to strengthen faculty, staff, and student support services; to improve recruitment, retention, and graduation rates; and many others. Regarding graduate education in particular, Texas Southern University’s current priority plan includes the creation of seven new master’s programs and three new doctoral programs in high demand fields such as biomedical and pharmaceutical sciences, computer science, and management information systems. The doctoral program in pharmaceutical sciences was approved in July 2004. Prairie View’s current plan includes the creation of six new master’s programs and three new doctoral programs. The doctoral programs, which are in clinical adolescent psychology, educational leadership, and electrical engineering, have all been approved since the priority plan has been in effect.

In addition, Texas’s historically black public institutions participate in programs specifically designed to enhance the doctoral education experience for black students and to increase their participation in graduate programs. Both Prairie View A&M University and Texas Southern University participate in the Preparing Future Faculty program, initiated in 1993 as a partnership between the Council of Graduate Schools and the Association of American Colleges and Universities. This program provides an in-depth, internship experience for doctoral students to observe faculty engaged in teaching, research, and service activities. Furthermore, Prairie View’s University Scholars program prepares undergraduate students with high academic achievements to enter and complete graduate and professional programs at highly competitive institutions by working with faculty mentors on research and/or creative projects. Texas Southern University’s School of Law and School of Pharmacy have obtained grants from the U.S. Department of Education for their significant contribution to graduate education opportunities for Black Americans.
## Appendix E

### 2000 CIP* Code Taxonomy

<table>
<thead>
<tr>
<th>2-Digit Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Agriculture, Agriculture Operations, And Related Sciences</td>
</tr>
<tr>
<td>03</td>
<td>Natural Resources And Conservation</td>
</tr>
<tr>
<td>04</td>
<td>Architecture And Related Services</td>
</tr>
<tr>
<td>05</td>
<td>Area, Ethnic, Cultural, And Gender Studies</td>
</tr>
<tr>
<td>09</td>
<td>Communication, Journalism And Related Programs</td>
</tr>
<tr>
<td>10</td>
<td>Communications Technologies/Technicians And Support Services</td>
</tr>
<tr>
<td>11</td>
<td>Computer And Information Sciences And Support Services</td>
</tr>
<tr>
<td>12</td>
<td>Personal And Culinary Services</td>
</tr>
<tr>
<td>13</td>
<td>Education</td>
</tr>
<tr>
<td>14</td>
<td>Engineering</td>
</tr>
<tr>
<td>15</td>
<td>Engineering Technologies/Technicians</td>
</tr>
<tr>
<td>16</td>
<td>Foreign Languages, Literatures, And Linguistics</td>
</tr>
<tr>
<td>19</td>
<td>Family And Consumer Sciences/Human Sciences</td>
</tr>
<tr>
<td>22</td>
<td>Legal Professions And Studies</td>
</tr>
<tr>
<td>23</td>
<td>English Language And Literature/Letters</td>
</tr>
<tr>
<td>24</td>
<td>Liberal Arts And Sciences, General Studies And Humanities</td>
</tr>
<tr>
<td>25</td>
<td>Library Science</td>
</tr>
<tr>
<td>26</td>
<td>Biological And Biomedical Sciences</td>
</tr>
<tr>
<td>27</td>
<td>Mathematics And Statistics</td>
</tr>
<tr>
<td>29</td>
<td>Military Technologies</td>
</tr>
<tr>
<td>30</td>
<td>Multi/Interdisciplinary Studies</td>
</tr>
<tr>
<td>31</td>
<td>Parks, Recreation, Leisure And Fitness Studies</td>
</tr>
<tr>
<td>38</td>
<td>Philosophy And Religious Studies</td>
</tr>
<tr>
<td>39</td>
<td>Theology And Religious Vocations</td>
</tr>
<tr>
<td>40</td>
<td>Physical Sciences</td>
</tr>
<tr>
<td>41</td>
<td>Science Technologies/Technicians</td>
</tr>
<tr>
<td>42</td>
<td>Psychology</td>
</tr>
<tr>
<td>43</td>
<td>Security And Protective Services</td>
</tr>
<tr>
<td>44</td>
<td>Public Administration And Social Service Professions</td>
</tr>
<tr>
<td>45</td>
<td>Social Sciences</td>
</tr>
<tr>
<td>46</td>
<td>Construction Trades</td>
</tr>
<tr>
<td>47</td>
<td>Mechanic And Repair Technologies/Technicians</td>
</tr>
<tr>
<td>48</td>
<td>Precision Production</td>
</tr>
<tr>
<td>49</td>
<td>Transportation And Materials Moving</td>
</tr>
<tr>
<td>50</td>
<td>Visual And Performing Arts</td>
</tr>
<tr>
<td>51</td>
<td>Health Professions And Related Clinical Sciences</td>
</tr>
<tr>
<td>52</td>
<td>Business, Management, Marketing, And Related Support Services</td>
</tr>
<tr>
<td>54</td>
<td>History</td>
</tr>
</tbody>
</table>

* CIP = Classification of Instructional Programs. CIP Code System in administered by the National Center for Education Statistics of the U.S. Department of Education
Appendix F

Data Analysis Methodology for Doctoral Degree Completion Rates and Time to Doctoral Degrees in Texas

A cohort analysis was used to investigate doctoral attrition and time-to-degree rates. Based on information provided by the institutions on the Student Report (CBM 001) and Graduation Report (CBM 009) to the Coordinating Board, three cohorts were identified on the Coordinating Board’s database as first-time doctoral students at Texas public universities and health-related institutions.

These cohorts were developed by: 1) reviewing data from ten years prior to each start year, and 2) removing from each cohort students who had enrolled at the doctoral level before the start year (fall 1990, fall 1991, and fall 1992). Only institutions with students in each of the three cohorts were used in the analysis. Each cohort was tracked for ten years (i.e., FY1991 to FY2000, FY1992 to FY2001, FY1993 to FY2002) to determine those students who received a doctoral degree, those who only received a master’s degree, and those who received no degree.

For each student who received a doctoral degree, two computations were made to determine: 1) a registered time to degree (only adding the number of semesters in which the student was registered), and 2) a total time to degree (the elapsed time in semesters from the fall of in the cohort start year until the year the doctoral degree was received). It is acknowledged that although ten years was used to make the cohort time spans comparable, some students will obtain doctoral degrees beyond that time span.

Weighted averages were computed based upon the size of the cohort (by institution and by discipline area – two-digit CIP Code) to provide results that were more stable. Obviously, the larger the number of cohorts, the more reliable the averages become.
Appendix G - Completion Rates* of Doctoral Degrees in Education** by Texas University (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

Total Students:     161                   19                  254                   81                  117                 120                   218                   443               445             1,858

THECB 10/2004Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.

* Each cohort tracked for ten years.  ** "Education" includes CIP Code 13.

Note: Sam Houston State University is not included because the student cohorts equal fewer than five students.
## Appendix H - Completion Rates* of Doctoral Degrees in Engineering** by Texas University (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>University</th>
<th>Master’s Only</th>
<th>Doctorate</th>
<th>No Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamar University</td>
<td>16%</td>
<td>22%</td>
<td>63%</td>
</tr>
<tr>
<td>Texas A&amp;M University</td>
<td>40%</td>
<td>17%</td>
<td>30%</td>
</tr>
<tr>
<td>Texas Tech University</td>
<td>10%</td>
<td>53%</td>
<td>37%</td>
</tr>
<tr>
<td>Univ of Houston</td>
<td>23%</td>
<td>29%</td>
<td>56%</td>
</tr>
<tr>
<td>UT at Arlington</td>
<td>6%</td>
<td>49%</td>
<td>51%</td>
</tr>
<tr>
<td>UT at Austin</td>
<td>6%</td>
<td>45%</td>
<td>50%</td>
</tr>
<tr>
<td>UT at Dallas</td>
<td>0%</td>
<td>13%</td>
<td>87%</td>
</tr>
<tr>
<td>UT SoWestern Med. Ctr.</td>
<td>9.0%</td>
<td>40%</td>
<td>50%</td>
</tr>
<tr>
<td>Avg. for Engineering Discipline</td>
<td>10.0%</td>
<td>46%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Total Students: 32  343  60  248  158  559  39  13  1,452

* Each cohort tracked for ten years. ** "Engineering" includes CIP Codes 14 and 41.

Note: Baylor College of Medicine is not included because the student cohorts equal fewer than five students.

Sources: Texas Higher Education Coordinating Board; institutions’ CBM 001 and CBM 009 Reports.
Appendix I - Semesters of Doctoral Enrollment for Recipients of Doctoral Degrees in Education by Texas University (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

* Average number of semesters are weighted averages, based on doctoral graduates who began in fall 1990, fall 1991, or fall 1992.

Note: Sam Houston State University is not included because the student cohorts equal fewer than five students.

Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports. THECB 10/2004
Appendix J - Semesters of Doctoral Enrollment for Recipients of Doctoral Degrees in Engineering by Texas University (Fall 1990, Fall 1991, and Fall 1992 Student Cohorts)

<table>
<thead>
<tr>
<th>Institution</th>
<th>Total Grads</th>
<th>Average Number of Semesters*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamar University</td>
<td>7</td>
<td>11.6</td>
</tr>
<tr>
<td>Texas A&amp;M University</td>
<td>272</td>
<td>11.3</td>
</tr>
<tr>
<td>Texas Tech University</td>
<td>32</td>
<td>11.1</td>
</tr>
<tr>
<td>Univ of Houston</td>
<td>71</td>
<td>10.4</td>
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<tr>
<td>UT at Arlington</td>
<td>68</td>
<td>12.0</td>
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<tr>
<td>UT at Austin</td>
<td>378</td>
<td>11.4</td>
</tr>
<tr>
<td>UT at Dallas</td>
<td>15</td>
<td>9.4</td>
</tr>
<tr>
<td>UT SoWestern Med. Ctr.</td>
<td>6</td>
<td>13.4</td>
</tr>
</tbody>
</table>

* Average number of semesters are weighted averages, based on doctoral graduates who began in fall 1990, fall 1991, or fall 1992.

Note: Baylor College of Medicine and The University of Texas at El Paso are not included because fewer than five students graduated from these cohorts.

Sources: Texas Higher Education Coordinating Board; institutions' CBM 001 and CBM 009 Reports.
Appendix K

Efforts to Increase Doctoral Student Persistence at the University of California at Berkeley: Best Practices Implemented as a Result of California’s 1991 Study of Doctoral Education

Note: The following summary combines information from two academic articles by Maresi Nerad and Debra Sands Miller (1996, 1997) regarding the University of California at Berkeley’s efforts to increase doctoral student graduation rates and decrease their time-to-degree.

Background

In 1990, concern about the high attrition rates of doctoral students resulted in California State Senate Concurrent Resolution 103, which mandated a study of doctoral completion rates. In 1990, the Office of the President of the University of California (UC) commissioned a study of time-to-degree and factors affecting completion. This study examined time-to-degree on all nine UC campuses using data on earned doctorates for three cohorts of UC doctoral recipients over a ten-year period. The study found that the median elapsed time-to-degree had increased by 1.3 years from 1968 to 1988. An analysis of the data by major fields of study demonstrated that the length was greatest in the arts and humanities and the social sciences.

This study also analyzed doctoral completion rates. In 1991 only the UC Berkeley campus had collected data that allowed for such analysis, so this portion of the study included only UC Berkeley students. The Berkeley database identified completion rates by each entering cohort from 1975 through 1983. Entering cohorts were tracked over a twelve-year period to ensure that the vast majority of students had time to complete the degree. Three annual cohorts were grouped together to provide a larger number of cases for analysis (i.e., entering cohorts 1975-1977, N = 3,852 students; entering cohorts 1978-1980, N = 3,748 students; and entering cohorts 1991-1993, N = 3,553 students). Findings revealed that completion rates varied widely across major fields of study. Students in the humanities and social sciences had the lowest completion rates; biological and physical science doctoral students had the highest. Findings also revealed that a low completion rate correlated with long time-to-degree.

Further investigations of these data showed that the majority of students left during their first three years of graduate study (31 percent), generally before they advanced to doctoral candidacy, and a smaller number (11 percent) left after advancement to candidacy, between the fourth and twelfth years. However, when attrition rates were compared between humanities and social science doctoral students and biological and physical sciences doctoral students, the attrition rates were found to be higher for humanities and social science students after they had advanced to candidacy.

Analysis of financial support patterns revealed that support patterns in the humanities and social science disciplines were among the reasons that students in these disciplines took longer to complete their degrees and had higher attrition rates. While students in the sciences primarily supported themselves with research assistantships, students in the humanities and social sciences depended on teaching assistantships and their own earnings for support. Prior research had shown that students whose major financial support came from their own or a spouse’s earnings took the longest average time to complete their degrees (11.0 years), and those supported by research assistantships completed their degrees in the shortest average time (7.0 years).
Qualitative research, which consisted primarily of semi-structured, in-depth individual interviews, collaborated quantitative findings. Focus group interviews conducted with humanities and social science students revealed particular field-specific obstacles that delayed or prevented doctoral degree completion. In addition to financial factors, these interviews revealed that writing dissertations posed more challenges for students in the humanities and social sciences, due to the following reasons. Specifically, students in the humanities and social sciences:

- Usually face a solitary research and writing experience and have less frequent interaction with their advisor and peers than do students working in biological and physical sciences laboratories;
- Tend to encounter greater difficulties than their counterparts in the hard sciences when they cease to be engaged in reading and become responsible for producing original research material based on research findings;
- Often encounter a lack of consensus about what constitutes an appropriate doctoral research project; and
- Are reliant upon the advising relationship for the dissertation process and doctoral completion, because the decision about the dissertation's scope and character rests particularly with the main dissertation advisor.

**Support Structures and Programs Developed for Doctoral Students at UC Berkeley**

In response to research findings and to address students’ concerns, the Graduate Division at UC Berkeley adopted a three-pronged approach to improving doctoral student retention and reducing time-to-degree:

1. **Institutional Policies and Strategies**

   - **Monitoring of Progress.** The Graduate Division systematically monitors completion rates and the progress of graduate students throughout their graduate careers and regularly reports its findings to departments. When necessary, the Graduate Dean conducts a half-day visit to the department.

   - **First-Year Evaluations.** Departments conduct a first-year evaluation, during which a team of faculty meets separately with each student.

   - **Annual Reports on Progress in Candidacy.** Departments conduct and report to the Graduate Division an annual review of doctoral candidates for purposes of faculty advising and mentoring.

   - **Financial Support Structures.** Departments are encouraged not to allocate all their funds for fellowships to attract new students, but to reserve a portion for students at later stages of the degree program.

   *Note: Financial support package recommended for departments in the humanities and social science disciplines includes the following: fellowships for the first year, teaching assistantships for years two and three, fellowships at the conceptualizing stage of the dissertation, and, if available, research assistantships for one year and dissertation-writing fellowships for the final year.*
2. Work with Departments

- **Distinction between Advising and Mentoring.** Advisors are responsible for assisting students in selecting programs of study and for ensuring that students make adequate progress toward requirements. Mentors are responsible for helping the protégé set goals and standards and develop skills, protecting the protégé from others, and facilitating a successful entrance into academic and professional schools. Mentoring is the acknowledged responsibility of the entire department.

- **Graduate Assistant Advisory Group.** This 15-member group acts as a liaison between the Graduate Division and graduate assistants for sharing information and voicing concerns.

- **Guide for Graduate Students.** The guide *Easing the Way for Graduate Students* provides positive examples of successful departmental activities.

3. Work with Students

- **Orientation Programs.** These first-semester graduate student orientations are organized by the Graduate Division and provide information on the stages of the doctoral program.

- **Grant Proposal Writing Workshops.** These workshops and individualized consultations are offered to graduate students throughout the academic year to assist students in locating and applying for funding.

- **Dissertation Writing Workshops.**
  
  - **Three-Day Topical Interdisciplinary Dissertation Workshops.** These off-campus workshops bring together three to four faculty and twelve students writing dissertations on closely related subjects but in different disciplines. *Note: Because of the small fraction of graduate students that can be served by the formal workshop, faculty members have begun organizing dissertation workshops in their own departments or areas of interest.*
  
  - **Day-long Dissertation Writing Workshops.** These workshops focus on the practical aspects of dissertation writing and strategies for working effectively with the dissertation advisor.

- **Dissertations-in-Progress Abstract Database.** This database of abstracts of UC Berkeley dissertations in progress is accessible from a university library Web page, and searchable by students. The abstracts include information on how to contact the author. A set of seminar rooms have been designated in the library for group meetings of doctoral students.

- **Academic Publishing Workshop.** This two-hour workshop provides students with information about publishing dissertations as journal articles or books through an academic press.
• **Academic Publishing Guide.** This guide provides students with written information about publishing dissertations as journal articles or books through an academic press.

• **Newsletter for Graduate Students.**

• **Academic Job Search Assistance.**

**Outcomes**

A comparison of the cohorts that entered between 1975 and 1977 with the cohorts that entered between 1981 and 1983 revealed that, overall, the doctoral completion rate increased by 11 percent. In languages and literatures, doctoral completion rates increased from 27 percent to 43 percent. In the social sciences, the rate went from 43 percent to 52 percent. While it is not possible to establish a direct causal link between the programs developed for doctoral students and improved doctoral completion rates, the institution believes that, to some degree, improved completion rates are the result of the Graduate Division’s three-pronged approach, and particularly the Division’s efforts to assist students during the dissertation-writing phase of the doctoral dissertation.

**Staff Comment**

Given that the support structures and programs developed at UC Berkeley are related to improved doctoral completion rates at arguably one of the best higher education institutions in the nation (and which benefits from attracting some of the best students in the U.S.), staff believes that such efforts also are likely to contribute to improved doctoral completion rates at institutions in Texas.