

## 2. RESEARCH, COMPETITIVENESS, AND TECHNOLOGY TRANSFER

## 2. Increasing Research, Global Competitiveness, and Technology Transfer

Today, policy, business, and education leaders at the federal, state, and institution levels are underscoring the importance of research and technology transfer to generate new ideas and harness them to new products and companies in order to increase the nation's success in the global economy. Universities play a critical role in this ambitious agenda because their faculty and research staff conduct so much of the basic research and development in the United States.

The National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine released the influential report in 2006, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. It states forcefully that, because advanced scientific and engineering work is underway in many nations that have the

advantage of low cost employees, the United States must improve its competitive economic position by focusing on its knowledge-based resources, particularly in science and technology, and by sustaining the most fertile environment for new and revitalized industries that provide well-paying jobs.

In his 2006 State of the Union address, President George W. Bush further articulated the commitment of his administration to enhance America's competitiveness in the global economy through increased investments in research. He outlined an American Competitiveness Initiative to increase graduation rates of college students well versed in mathematics, science, and engineering and emphasized that the bedrock of America's economic competitiveness is a well-educated and skilled workforce.

Texas created the Emerging Technology and Enterprise Funds to identify key areas of public-private-higher education partnerships in research, technology transfer, and economic development for communities across the state. The funds will help develop and diversify the economy of this state by expediting innovation and commercialization of research; attracting, creating, or expanding private sector entities that will promote a substantial increase in high-quality jobs; and increasing higher education applied technology research capabilities.

The University of Texas System must sustain and accelerate its contribution to the state's and nation's long tradition of

*"Keeping our competitive edge in the world economy requires focused policies that lay the groundwork for continued leadership in innovation, exploration, and ingenuity. America's economic strength and global leadership depend in large measure on our Nation's ability to generate and harness the latest in scientific and technological developments and to apply these developments to real world applications."*

innovation, particularly in cutting-edge and critical areas of science, technology, and engineering. Using its faculty STARS program, the UT System is making competitive funds for facilities and equipment available to universities and health institutions to help attract nationally distinguished faculty, both to carry out cutting-edge science and engineering and to provide a research-enhanced education for the next generation, with further benefits to an educated high-technology workforce and contributions to the American quality of life. It is critically important that industry and government be fully engaged with UT System institutions in these endeavors.

The overarching goal is to advance the position of The University of Texas System as a system of the first class, especially renowned for its cutting-edge interdisciplinary research, leveraging faculty strengths in and across academic and health institutions. Over the next decade, the UT System will specifically address: increasing the UT System's and Texas's competitive edge; enhancing research; increasing technology transfer; developing top-tier universities and distinctive strengths on each campus; and increasing the UT System's impact on workforce development.

## Helping to Keep Texas Competitive

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### Goal

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The UT System will continue to identify and enhance its natural advantages and distinctive strengths, building on recent and past successes in such areas as medical research, information technology, energy, and nanotechnology. It will identify and organize resources, personnel, and academic structures to be sufficiently flexible to anticipate new research areas, which may exist only for defined periods of time or may go on indefinitely.

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### Strategies

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#### **Define high-potential areas for partnerships and cross-System regional research centers.**

Areas in which the UT System has interests and strengths on multiple campuses, is internationally known, or has the potential to gain distinction include:

- Health research – cancer, infectious disease, diabetes
- Drug diagnostics and development
- Security issues
- Energy
- National labs, e.g., Sandia
- Information technology
- Nanotechnology and nanoelectronics

#### **Become a partner of choice for high-tech collaborations.**

The UT System and its institutions will lead the nation in the formation and implementation of innovative and diverse partnerships from within and external to the System. As a partner of choice for high-tech collaborations – with Texas Instruments, for example – the UT System will help make Texas a “top destination for innovative technology companies” (Perry, 2006).

- Build on existing collaborations – for example, the Strategic Partnership for Research in Nanotechnology (SPRING) involving UT Arlington, UT Austin, UT Dallas, UT Brownsville/TSC, UT Pan American, Rice University, and the Air Force Materials Research Labs; the Regional Center of Excellence in Biodefense and Emerging Infectious Diseases, involving UT Medical Branch - Galveston, UT Health Science Center - Houston, UT Health Science Center - San Antonio, UT Health Center - Tyler, and more than 20 other academic, governmental, and business entities; and the Regional Academic Health Center in South Texas.
- Form new collaborations – for instance, the UT System's involvement with the Texas Enterprise and Emerging Technology Funds and the formation of a National Nanoelectronics Institute.

- Leverage investments in high-cost high-tech infrastructure – for example, investment in computing capabilities through the Texas Advanced Computing Center which, in partnership with Dell Inc. as the leading technology provider, will substantially increase the capabilities of and access to the Lonestar high-performance computing cluster.
- Act as catalyst for external interinstitutional efforts – these will include exploration of the development of a technology transfer incubator, for example, the Big 12 Center for Economic Development, Innovation and Commercialization.
- Strengthen and support communication – the UT System will leverage its convening ability to enhance person-to-person interactions, such as the initiation of meetings for vice presidents of research from the 15 UT System institutions. The System may organize forums on high-priority topics like energy and security that are likely to develop into major initiatives.
- Host a collaborations symposium for UT System institutions to share best practices and consider topics such as: shared research infrastructure, joint appointments, UT System actions and services to enhance collaborations, identification of potential partners, and more.

**Invest in infrastructure and staff to support the formation of research and technology partnerships.**

- To achieve global competitiveness, the UT System is significantly enhancing the infrastructure support for research development and technology transfer at the System level and on each campus.
- As described in the following sections, the UT System is expanding central staff with experience and competence to support development and tracking of research proposals, grants, and commercial partnerships and to assist campuses to develop local resources as appropriate to the scale of their operations.

**Securing Texas’s Energy Future**

The UT System is positioned to lead the nation and state in finding solutions to the looming energy crisis. The current and projected shortage of useable energy demands new fuel supplies that are more abundant, less costly, more efficient, and more environmentally friendly than petroleum.

Leading edge energy research is underway across the UT System. It is a partner in the Texas bid for FutureGen. The System has approved development of the predesign of a high-temperature gas-cooled reactor in West Texas. The System is exploring the development of a multi-institution entity that would focus on energy studies. Texas leads the nation in the application of wind energy. And UT System institutions are leaders in the application of nanotechnology to energy production and efficiency.

A System-wide energy initiative and strategic plan will encourage more comprehensive cross-institution and public/private partnerships to expedite the development of a cost-effective energy source to create and secure stable global energy supply and use.

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*Metrics*

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- Number of important large-scale, cross-institution partnerships formed, e.g., the nano-electronics initiative, the Los Alamos Academic Network, and the retaining of Freescale and Samsung in Austin
- Selection of Texas for major investments, for example, the national biocontainment lab

## Enhancing Research

### Goal

The UT System will increase its research position among the highest rated academic systems in America.

- Currently performing \$1.7 billion in research expenditures in FY 2005, the UT System should increase total research expenditures to at least \$3 billion by 2015.
- Qualitatively, the overarching goal is for the UT System institutions to comprise universities of national distinction in research and training. Current examples include UT Austin's prominence in many fields including computer science, wireless networking and communications, chemistry/biochemistry, and physics; UT M. D. Anderson Cancer Center in the field of cancer research and treatment; and UT El Paso in the training of Hispanic scientists and engineers. Each institution is recognized nationally for these qualities, through federal grants, representation on influential policy groups, and invitations to participate in the most prestigious international conference in their areas of distinction.

### Strategies

#### System-wide actions.

At the UT System level, multi-institutional collaborations and projects are encouraged and facilitated, as noted above, and System infrastructure and activities will be increased through the Office of Research and Technology Transfer to support research development:

- Helping empower current faculty to engage in much bigger projects than they could pursue individually.
- Continuing to emphasize the System's distinctive leveraging strength of collaborations between academic and health campuses.
- Helping to track and identify potential areas of collaboration by creating a more comprehensive database of research interests and expertise across institutions.
- Informing the 15 institutions about emerging federal and state trends and, where possible, influencing these trends.



- Contributing to the recruitment of star faculty in high-priority fields through the STARS initiative that makes competitive funding available for capital investment.
  - Developing a recognition program for the faculty, working with the Academy of Medicine, Engineering and Science of Texas on research awards and establishing Chancellor's awards for entrepreneurship and innovation.
  - Making services available through the Office of Research and Technology Transfer for professional development and advice on the establishment and enhancement of campus-based research development offices to assist faculty in identifying funding sources, forming collaborative groups to develop joint proposals, preparing grant proposals, and tracking the progress and success of funded projects.
1. Support for, and in some cases identification of, consultants knowledgeable about the relevant federal agencies or other substantial sponsors of awards.

2. Support to get major proposals off the ground. At a minimum, this may require hiring temporary grant coordination support and providing matching funds by the System and/or the institutions.
3. Identification of experts to provide assistance in grant writing to the institutions.
4. More systematic linkages between the smaller, Hispanic-serving institutions with more developed academic research enterprises in order to win larger inter-institutional awards that include a workforce element.
5. Provide research administration training courses ("Research 101") across the campuses.
6. Help for institution faculty to make productive contacts and build networks at federal and state agencies and with Texas businesses.

**Campus-specific actions.**

Through their academic planning, Compact, and budget processes, each campus will continue to identify funds to add and retain star faculty in relevant high-priority fields. For eight academic institutions, excluding UT Austin, the Washington Advisory Group (WAG) set out goals and identified areas of current or potential faculty expertise. The WAG report ([www.utsystem.edu/ipa/wag](http://www.utsystem.edu/ipa/wag)) defined the benchmark to becoming a top-tier university as achieving \$100 million annually in research expenditures, coupled with existing or planned doctoral programs in targeted fields.

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- Increases projected in sponsored expenditures from \$1.7 billion in 2005 to \$3.0 billion in 2015
- Increases in sponsored expenditures in targeted areas
- Development of doctoral programs in select targeted areas
- Increases in number and proportion of faculty applying for and receiving grants
- Increase in campus and System positions in national research rankings
- Examples of inventions in medicine that save lives
- Numbers of high-technology professionals and scientists (postdoctoral fellows, continuing education students, doctoral/professional students) trained by UT System institutions
- Selection of UT System institution faculty for service on review panels
- Increased number of national academy members



## Increasing Technology Transfer

The transfer of investments in research and development innovation into the economy is a continuing and growing trend. A 2006 study, for instance, by economists at Indiana University and Germany's Max Planck Institute of Economics reported that more than one quarter of scientists who received National Cancer Institute grants from 1998 to 2002 and who were awarded patents said they had also started their own business. Institutions that compete successfully for research funding, particularly in "STEM" and health research areas, are positioned to compete well in technology transfer.

Traditional technology transfer is concerned with intellectual property rights and the spin-off companies resulting from university research. The UT System has adopted a more comprehensive approach to increasing technology collaborations, including the attraction and retention of high-tech companies to Texas and the training of the next generation who will work in technical areas.

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### Goal

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The UT System currently ranks high in tech transfer, placing third nationally in numbers of patent awards in 2005, and eleventh in technology transfer revenue. Yet, this success is distributed unevenly among institutions and more can be accomplished. In ten years, the UT

System should increase its technology transfer income from the \$30 million received in 2004 to \$49 million in 2015.

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### Strategies

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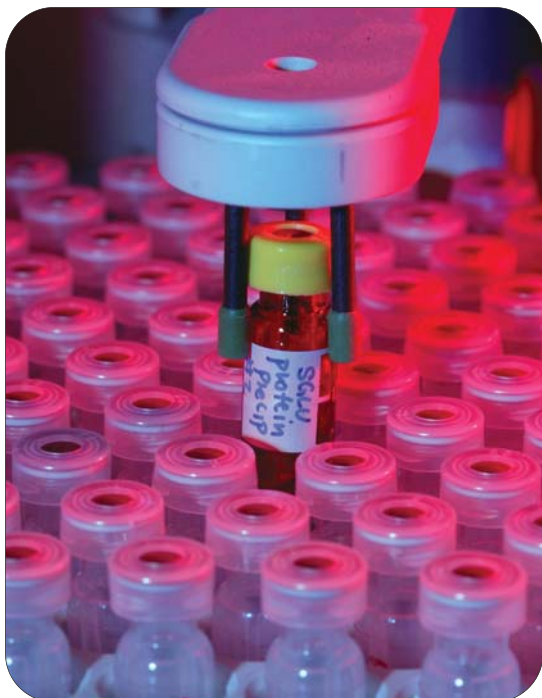
Through its Office of Research and Technology Transfer, the UT System is developing a differentiated range of centralized services and support for local development of technology transfer capacity as appropriate to each institution's size, expertise, and scale of activity.

#### **Provide and widen sources of information.**

- Develop and maintain a central database of available technologies and faculty research interests based on information from its 15 institutions.
- Provide information about national best practices for licensing and commercialization.
- Compile a directory of UT System inventions and innovations that have made it to market and those in the development pipeline, comprising a living, continuously evolving document that would also serve as a preface for a UT System Technology Showcase.
- Lead a case-study discussion, based on real UT System successes, especially in the context of how the academic inventors solved the problem of the technology "valley of death" in commercializing nascent technologies as they matured from lower to higher Technology Readiness Levels.
- Create symposia for research centers emphasizing translational research to encourage the movement of basic research beyond publication alone as an endpoint to the production of marketable inventions.
- Set up an entrepreneurship lecture series for the UT System analogous to the highly successful Life Sciences Entrepreneurship and Mentoring series at UT M. D. Anderson Cancer Center.

**Form advisory groups and identify partners.**

- Form advisory groups to identify potential partners and investors. The UT System formed two committees comprised of Texas business leaders, including a Research Advisory Committee and a Technology Transfer Advisory Committee. Because of their memberships, both committees will furnish useful counsel to the UT System regarding technology transfer. An emerging idea is identifying “angel investors” who could act as both donors and sponsors for university inventions. Another source of useful ideas will be the Big 12 Center for Economic Development, Innovation and Commercialization, as mentioned previously, from which best practices as well as specific collaborations will arise.
- Continue to work closely with the state government through the Emerging Technology Fund, the Texas Enterprise Fund, and the Nanoelectronics Initiative.
- Seek sufficient investment capital.
- Showcase research and technology transfer within the UT System to raise the profile of these activities and to highlight successes.



**Provide and strengthen technology transfer services and infrastructure.**

- Provide differentiated logistical assistance for technology transfer matched to the varying needs of UT System institutions. Campuses with well-established programs may not require extensive assistance, while the emerging universities will need a full range of patent assistance.
- Support identification for all campuses of increased funding to file and maintain patents – especially costly foreign patents – and access to investors. The concept of identifying “angel investors” for this intellectual property activity emerged from the first meeting of the UT System Technology Transfer Advisory Committee, to help acquire funds and for the expertise that could be brought to bear.
- Provide expertise and legal services through the System Office of General Counsel in filing patents, finding licensees, and establishing start-up companies, as well as some assistance, especially for the emerging institutions, in determining what to patent and market.
- Establish a central database of available technologies and existing licenses. A System-wide database of research interests would enable greater internal and external collaborations. UT Arlington is developing a promising database that might be adaptable System-wide for these purposes of research and technology transfer, and, at the request of the Faculty Advisory Council, the UT System Office of Academic Affairs is developing an electronic means of identifying research interests.
- Develop a plan to facilitate “regional tech transfer.” For example, enhancing the technology transfer office at UT Southwestern Medical Center - Dallas to also handle tech transfer for UT Dallas and UT Arlington, who would provide some funding or other services to UT Southwestern in return. Where feasible, the UT System will help develop regional partnerships among the institutions by determining the variable needs of the different institutions and providing logistical support.
- Collect best practices and support from the Texas business community. The Office of Research and Technology Transfer will help gather support and ideas from the business

community by working with business leaders and forming advisory committees such as the Research Advisory Committee and the Technology Transfer Advisory Committee. The Research Advisory Committee is already active and has generated ideas that include the concept of “angel investors”/donors for UT System technologies and the idea of a UT System Technology Showcase.

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## Metrics

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- Increase technology transfer revenue from \$30 million in 2004 to \$49 million in 2015
- Increase in numbers of spin-off companies from 58 started in 2001 through 2004
- Document ways in which UT System institutions have helped Texas become more competitive through the attraction and retention of companies

## Developing Additional Top-Tier Universities and Areas of Strength

*“There has been a lot of universality in the Texas model of higher education in comparison with the California model which is more selective for different campuses. The California model offers the opportunity for excellence that the current Texas model makes more difficult to achieve. Within certain constraints, recognizing that it is not possible to completely duplicate the California approach, and that Texas has moved somewhat in that direction, the state needs to move even farther.”*

National and state economic competitiveness require that the State of Texas develop more top-tier universities, and that every institution develop focused concentrations of academic strength. The need for greater academic strength was recognized as one of the four pillars of the state’s master plan for higher education, *Closing the Gaps*.

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## Goal

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To establish one or more areas of expertise nationally recognized at each academic institution; to develop multiple institutions capable of producing high-quality scholarship, creativity, and research.

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## Strategies

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### **Recruit and retain the best senior and junior faculty.**

First-rate faculty are absolutely critical to developing academic areas of strength and top-tier institutions. Continuation of the STARS initiative will help provide start-up packages at seven of the nine academic institutions. In addition, both the System and the campus administrations should support hiring of excellent new faculty and support the professional development of experienced faculty. The campuses should examine additional ways to recognize excellent teaching and undergraduate research as areas of academic strength.

### **Engage faculty in identifying and discussing emergent areas of expertise.**

Each campus is engaged in identifying areas of distinctiveness and excellence as part of its strategic planning, and development of campus Compacts. In the 21st century, many of the most productive areas of research development will be interdisciplinary. The UT System should provide programs and incentives to encourage faculty to discuss their areas of disciplinary

overlap and to identify those areas where clusters of strength and interdisciplinary research opportunities may lie at each campus and across UT System institutions. Wherever possible, collaborations with public and private partners should be encouraged to deepen areas of expertise. The UT System will encourage the formation of multicampus “virtual departments” that can be used as an incentive for recruiting top faculty.

**Provide centralized assistance for campuses with new research efforts.**

*“The UT System has a responsibility to assure that campuses are good in certain areas, not trying to do everything well, which dilutes resources. The System’s role is to coordinate this sorting process.”*

The UT System can provide assistance with issues such as research compliance, training in the preparation of grant proposals, and technology transfer. Continued support of the System-wide digital library is critical to providing access to scholarly communication. The UT System should also consider its support of System-wide site licenses for software and the support of advanced computing resources.

**Continue to implement recommendations from the WAG Report.**

The WAG report, which provided a guide to research development and encouraged collaboration between academic and health campuses, continues to provide helpful insights about distinctive strengths and areas for future growth.

**Strengthen campus leadership and faculty development.**

To support and drive the vision for each institution requires identification and support for strong administrative and faculty leadership. Some campuses are addressing this significant need, and the UT System can build on these efforts and provide value-added assistance through the initiation in 2006-07 of a plan to develop and implement a System-wide leadership initiative. This might include development of programs such as a Leadership Academy for

department heads and deans. Over the same period, the System will initiate a parallel effort to highlight the importance of and provide assistance in faculty and staff development, to refresh and recharge senior faculty members, for example, through intercampus exchanges.

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*Metrics*

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- Increase in proportion of faculty who have published in a peer-reviewed outlet in the previous year
- Increase in proportion of faculty who hold external funding
- Increase in proportion of undergraduate students who participate in research
- Increase in graduate/professional enrollments from 42,800 to 48,800 in 2015
- Increase in number of doctoral degrees granted from 1,240 to 1,520
- Increase in dollar value of research expenditures and of federal research expenditures
- Increase in number of patent awards and dollar value of royalties and licenses
- Evidence of increased research collaborations within and among campuses

*“Each campus fills a unique role in its region and in the state. Perhaps the most challenging topic to address in this plan is mission differentiation, areas of focus, and optimum size of each campus, recognizing that each institution aspires to excellence in multiple goals, and that this is not the only system in the state.”*

### Distinctive Strengths

#### UT System Academic Institutions

UT System institutions provide a wide range of academic, research, and service programs to their students and communities. At the same time, each campus is focusing on areas of existing or potential distinctive strength – where faculty interests and expertise coalesce around cutting-edge and high-priority research and academic topics. These topics may be unique to a campus while, in other cases, as with energy, nanotechnology, security, bioscience and engineering, health, and Texas border issues, these strengths cut across institutions.

#### TODAY

- Biotechnology and Bioengineering
- Healthcare
- Manufacturing
- Nanoelectronics and Semiconductor Technologies
- Energy
- Aerospace and Defense

- Computer Science
- Wireless Networking and Communications
- Chemistry/Biochemistry and Physics
- History
- Psychology
- Astronomy

- Center for Gravitational Wave Astronomy
- Center for Biomedical Studies
- Cross Border Institute for Research and Development

- Audiology and Communication Disorders
- Neuroplasticity
- Solar Atmosphere Physics
- Materials Science
- Nanoscience
- CyberSecurity

#### TOMORROW

##### UT Arlington

- Radio Frequency Identification Center of Excellence
- Structural Engineering Center of Excellence
- Flexible Electronic Device Center of Excellence
- Center for Renewable Energy Science and Technology
- Bioscience and Bioengineering Center of Excellence

##### UT Austin

- Architecture
- Law and Policy Studies
- Nanoscience and engineering
- Mathematics, especially applied
- Neuroscience/Neurobiology/Molecular Biology
- Environmental Science and Engineering/  
Renewable and Innovative Energy Resources

##### UT Brownsville

- Center for Master Teaching
- Center for Early Childhood Studies
- Center for Culture and Communication
- Center for Computational Visualization
- Center for Coastal and Environmental Studies

##### UT Dallas

- Molecular Biology of Human Disease
- Natural Language Processing
- Systems Biology
- Geospatial Information Science
- Complex Systems and Risk Analysis
- Signals and Information Transmission and Processing

**Distinctive Strengths**

UT System Academic Institutions

TODAY

TOMORROW

UT El Paso

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| <ul style="list-style-type: none"> <li>• Biomedical, Health and Hispanic Health Disparities</li> <li>• Border Security</li> <li>• Environmental and Earth Science</li> <li>• Emerging Technologies</li> <li>• Borderlands Arts and Humanities</li> <li>• Education of U.S. Hispanics, PreK-Ph.D.</li> </ul> | <ul style="list-style-type: none"> <li>• Immigration and Policy Studies</li> <li>• Defense Systems</li> <li>• International Borders Studies</li> <li>• U.S.-Mexico Business and Economics</li> </ul> |
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UT Pan American

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| <ul style="list-style-type: none"> <li>• Center for Manufacturing Engineering – Rapid Response Manufacturing</li> <li>• Border Health Issues</li> <li>• Border Economic Issues</li> <li>• International Business</li> <li>• Pre-Medical Student Preparation</li> </ul> | <ul style="list-style-type: none"> <li>• Language, Culture, Literacy and Educational Policy and Practice</li> <li>• Life Sciences, Allied Health, Bioengineering, Information Systems and Computational/Engineering Technologies</li> <li>• Border Economics, Social and Economic Policy and International Practice</li> <li>• Border Health Issues</li> <li>• Raúl Yzaguirre Policy Institute</li> </ul> |
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UT Permian Basin

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| <ul style="list-style-type: none"> <li>• Public Leadership</li> <li>• Energy Studies</li> <li>• Distance Education</li> <li>• Preparation of Professionals</li> </ul> | <ul style="list-style-type: none"> <li>• Public Leadership</li> <li>• Energy Studies</li> <li>• Distance Education</li> <li>• Preparation of Professionals</li> </ul> |
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UT San Antonio

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| <ul style="list-style-type: none"> <li>• Information Assurance and Security</li> <li>• Emerging Diseases and Health Issues</li> <li>• Economic Development and Finance</li> <li>• P-16 Programs</li> <li>• Educating Hispanic Students</li> </ul> | <ul style="list-style-type: none"> <li>• Globalization/International/Cross-Cultural Programs</li> <li>• Regenerative Biology</li> <li>• Aging/Health/Wellness</li> <li>• Physical Sciences</li> <li>• Technology/Transportation</li> </ul> |
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UT Tyler

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| <ul style="list-style-type: none"> <li>• Center for Medieval and Renaissance Studies</li> <li>• Project Lead the Way</li> <li>• Gear-Up Program</li> <li>• Center for Leadership in Education</li> <li>• Hispanic Business Development</li> </ul> | <ul style="list-style-type: none"> <li>• Texas Asthma, Allergy, and Indoor Environmental Research and Education Institute</li> <li>• Center for Organic Semiconductor Modeling and Simulation</li> <li>• Research Cluster in Environmental Microbiology</li> <li>• Study and Prevention of Suicide</li> <li>• Math and Science Initiative</li> </ul> |
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## Increasing Impact on Workforce Development

A significant national issue is the continuing decline in the number of American citizens entering science and engineering which, if unstopped, will erode our scientific and engineering base and hinder innovation. This is not new, but rather has been going on for some time. This trend was somewhat masked before 9/11 because the top international students in science and engineering came to the United States for graduate study, after which many stayed or returned home but remained friends of America. However, the federal responses to 9/11 have resulted in decreasing numbers of international students, who are now going to Europe, Canada, and even Australia or staying in their home countries where their own universities are in many cases improving.



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### Goal

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Encourage more students to enter high-tech careers, with particular attention being paid to underrepresented groups of American citizens.

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### Strategies

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#### **Recruit more American students into science and engineering degree programs.**

Many students who would have entered these fields in the past are now going into medicine, law, and business instead because these fields have definite times to terminal degrees and to first professional positions. Modern science and engineering doctorates provide neither of these reasonable certainties. The focus of the country is now to encourage more American citizens, especially those who are also members of underrepresented minorities, to embark upon science and engineering careers.

- Leverage funds from the new American Competitiveness Initiative to support these students.
- Institute Chancellor's awards for achievements in encouraging more students to enter science and engineering careers.
- Ensure that external awards for research training are honored similarly to those for external awards for research and development.

#### **Work with K-12 systems to improve teaching and students' preparation in math and science.**

The number of high-tech graduates among underrepresented groups cannot be increased unless more such children are engaged in sciences and mathematics in middle and high school. The Institute for Public School Initiatives (IPSI) within the UT System is expanding its efforts to work with UT System institutions and schools to improve teaching and learning in "STEM" disciplines.

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## *Metrics*

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- Increase the number of graduates who enter the high-tech workforce
- Increase in the number of science, technology, engineering, and health graduates working in Texas
- Quantify the increase in numbers of technically-trained workers relative to national norms, especially comparisons of substantial analogous demographic groups, e.g., Hispanic high-tech employment across regions of the United States

