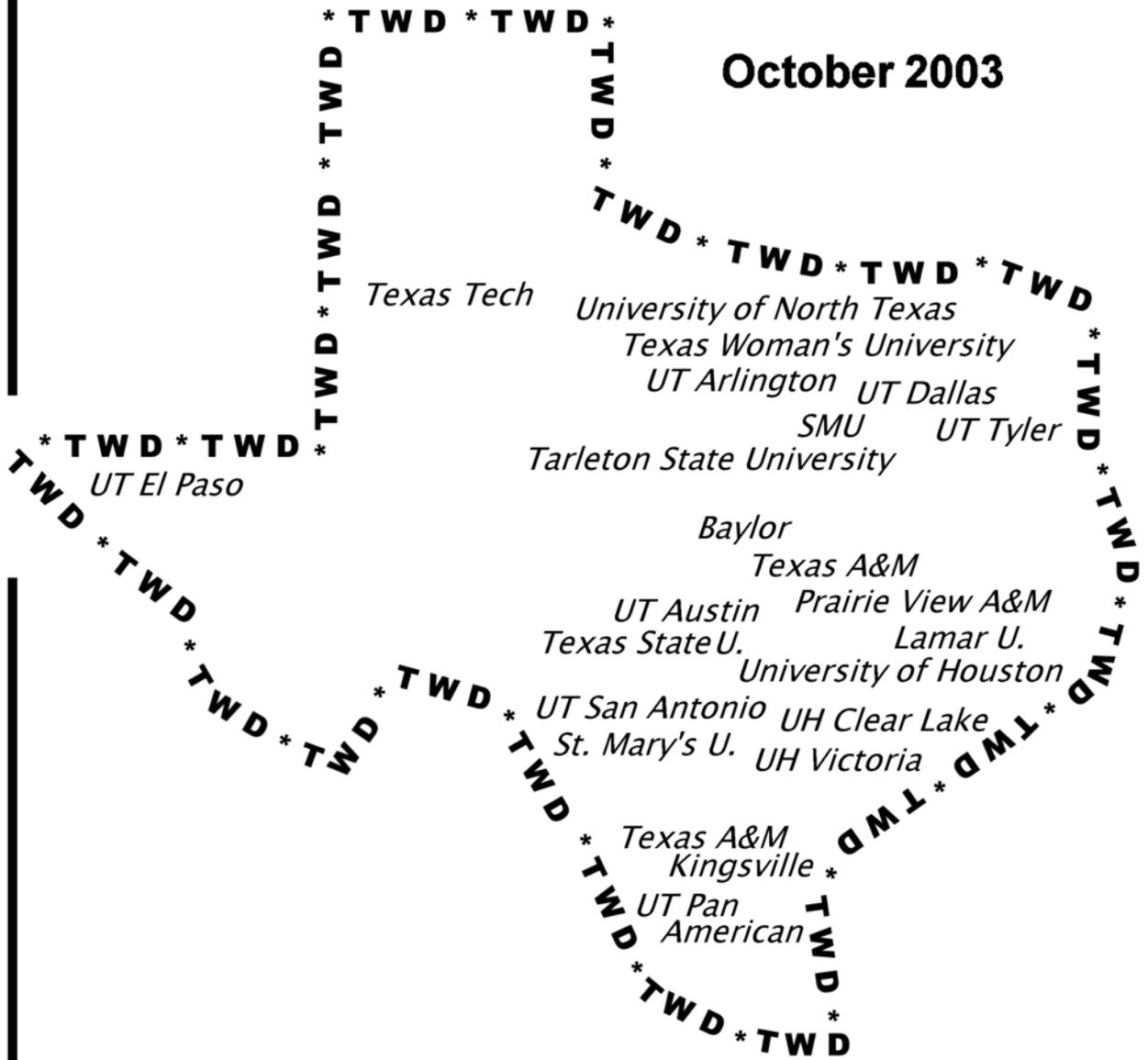


Texas Higher Education Coordinating Board  
Technology Workforce Development Grants Program

**2<sup>nd</sup> Annual Report**

**October 2003**



<http://www.thecb.state.tx.us/research/>

<http://www.tetc.us/>

## Table of Contents

Executive Summary .....	1
Program Progress for the First Round of Grants .....	2
External Review .....	5
Funding of Grants .....	6
Keeping Track of Student Enrollment and Graduation.....	9
Project Activities and Practices .....	11
Conclusions.....	18

## List of Figures

Figure 1	Industry Consortium Members' Contributions to Grants through August 31, 2003 .....	7
----------	--	---

## List of Tables

Table 1	Grant Statistics for the 2002 TWD Grants .....	2
Table 2	Texas Technology Workforce Development Grants Funded Awards: 2002....	3
Table 3	TETC Industry Members .....	7
Table 4	TWD Grant Funding Distribution .....	8
Table 5	Summary of Student Rosters from Fall 2001 to Spring 2003.....	10

## Executive Summary

In 2001, the 77th Texas Legislature passed Senate Bill 353, the Technology Workforce Development Act, in response to requests by industry to increase the number of electrical engineering and computer science graduates from higher education institutions in the state. This legislation created the Texas Engineering and Technical Consortium (TETC) and the Technology Workforce Development (TWD) Grants Program.

TETC is composed of representatives of university engineering and computer science programs throughout the state, as well as representatives from donor industries. Industry members of TETC raised and are raising cash and in-kind donations that the State matches for the TWD Grants Program. The legislation charges the Coordinating Board to administer the grants program.

The serious economic downturn in the high tech sector since the latter half of 2001 hampered TETC's fundraising efforts. Despite this setback, TETC raised \$2.775 million. Texas Instruments was the largest donor. This, combined with the State match, allowed the Coordinating Board to distribute \$5.3 million to 33 workforce development projects at 23 Texas institutions.

To increase the number of graduates in electrical engineering and computer sciences, the institutions are using strategies that improve the effectiveness of outreach, recruitment, retention, mentoring, and placement efforts as well as securing participation from underrepresented groups.

The TWD Grant Program supports the *Closing the Gaps by 2015* success goal. One of the strategies for achieving the success goal states:

*“Increase the number of students completing engineering, computer science, math and physical science bachelor’s and associate’s degrees and certificates from 14,500 to 19,000 in 2005; to 24,000 by 2010; and 29,000 by 2015.”*

TWD Grant Program goals written before the state's economic downturn projected a 13 percent increase in student numbers in these programs. The late start of the program (summer 2002) and the economic downturn has delayed this projection until 2004. At the recommendation of its TWD Grants Program Advisory Committee, the Coordinating Board allowed the institutions a no-cost extension for these awards, until August 31, 2004.

Program Progress for the First Round of Grants

The 77th Texas Legislature passed the Technology Workforce Development Act (Senate Bill 353) in 2001. The purpose of this legislation is to increase the quantity and quality of baccalaureate-level engineers and computer scientists produced by Texas universities. The legislation created the Technology Workforce Development (TWD) Grants Program and charged the Texas Higher Education Coordinating Board (CB) with its administration.

The law mandated both the creation of a TWD Grants Advisory Committee comprised of industry and academic members to provide oversight to the grants program and the creation of the Texas Engineering and Technical Consortium (TETC). TETC members include Texas public and independent universities that offer engineering and computer science programs and technology companies that employ graduates of those programs. The consortium fosters cooperative relationships and activities between the companies and the universities.

On April 1, 2002, Governor Rick Perry announced the first round of grant awards for 33 projects at 23 institutions. As required, the CB had used a peer review process for ranking the submitted proposals, of which 60 percent received grants. Table 1 lists the grant statistics. Table 2 shows all awarded projects, their institutions, and project titles. Rice University withdrew its project in the summer of 2003. Several projects formed a "joint" proposal with the title "Launching the Texas Engineering Education Pipeline: Deploying The Infinity Project Statewide." The Infinity Project is a partnership between leading research universities, industry, government, and K-12 educators to help school districts incorporate modern engineering and technology in their high school curricula.

**Table 1**

Grant Statistics for the 2002 TWD Grants			
Money distributed at the 64 percent funding level			
August 31, 2003			
Number of institutions funded:	23	Average \$ per institution:	\$230,434
Number of departments funded:	29	Average \$ per department:	\$182,758
Number of projects funded:	33	Average \$ per project:	\$151,516
		\$ for smallest project:	\$14,799
		\$ for largest project:	\$546,705
Number of joint projects within the Infinity Project:	15	Total \$ for the Infinity Project:	\$655,026

**Table 2**

<b><u>Texas Technology Workforce Development Grants Funded Awards: 2002</u></b>	
<b><i><u>Electrical Engineering Awards</u></i></b>	
<b><i>Launching the Texas Engineering Education Pipeline: Deploying The Infinity Project Statewide</i></b>	
Baylor University	\$24,435
Lamar University	\$45,656
Prairie View A&M University	\$49,900
Rice University	\$18,052
Southern Methodist University	\$62,180
St. Mary's University of San Antonio	\$31,940
Texas A&M University	\$37,296
The University of Texas at Arlington	\$57,678
The University of Texas at Austin	\$59,256
The University of Texas at El Paso	\$57,873
The University of Texas at San Antonio	\$57,680
<b><i>Increasing Electrical Engineering Program Enrollment: New Program, Increased Retention and College Transfers</i></b>	
Prairie View A&M University	\$248,084
<b><i>Enhancing the Quality and Quantity of Electrical and Computer Engineering Graduates</i></b>	
Texas A&M University (TEES)	\$546,705
<b><i>Expansion of the EE Program at TAMU-K with Scholarships and Tutoring</i></b>	
Texas A&M University – Kingsville	\$41,335
<b><i>Electrical Engineering Workforce Development at Texas Tech</i></b>	
Texas Tech University	\$204,176
<b><i>Undergraduate Retention and Recruiting of ECE Students at the University of Houston</i></b>	
University of Houston (Main Campus)	\$388,684
<b><i>Recruitment and Retention to Increase the Number of Undergraduate Students in the Electrical Engineering Program</i></b>	
The University of Texas at Arlington	\$197,200
<b><i>Increasing and Improving Texas Capability in Electrical Engineering</i></b>	
The University of Texas at Austin	\$546,581
<b><i>UTD School of Engineering and Computer Science -- TETC Undergraduate Expansion Program</i></b>	
The University of Texas at Dallas	\$446,911
<b><i>Electrical Engineering Recruitment and Retention Enhancement</i></b>	
The University of Texas - Pan American	\$172,450

**Table 2 (continued)**

<b><u>Computer Science Awards</u></b>	
<b><i>Study, Research, and Achievement in Lamar University Computer Science</i></b>	
Lamar University	\$63,526
<b><i>Enhance Computing Workforce &amp; Provide Higher Education in Computer Science to Working Professionals</i></b>	
Southwest Texas State University	\$391,932
<b><i>Launching the Texas Engineering Education Pipeline: Deploying the Infinity Project Statewide</i></b>	
Tarleton State University	\$14,799
Texas Woman’s University	\$36,975
The University of Texas at Arlington	\$72,756
The University of Texas at Tyler	\$28,551
<b><i>Increasing Computer Science Retention by Developing and Deploying Self-Paced Learning Modules</i></b>	
Texas A&M University (TEES)	\$271,807
<b><i>Efficient, Cost-Effective, Seamless, Advising Process to Increase CS Graduates</i></b>	
Texas Tech University	\$125,278
<b><i>Texas Scholars in Computer Science</i></b>	
University of Houston - Clear Lake	\$327,252
<b><i>Recruitment and Retention of Computer Science Students</i></b>	
University of Houston – Victoria	\$40,635
<b><i>Retention Strategies for Computer Sciences</i></b>	
University of North Texas	\$83,322
<b><i>Target Diversity: Increasing Graduation Rates by Recruiting and Retaining Underrepresented Populations</i></b>	
The University of Texas at Austin	\$235,858
<b><i>Building Strategic Pathways to the Baccalaureate Degree in Computer Science</i></b>	
The University of Texas at San Antonio	\$313,224

Torrence Robinson, Director of Public Affairs at Texas Instruments, Inc. and chair of the TWD Grants Advisory Committee summarized the driving force behind the workforce development program:

*"I believe the Texas Engineering and Technical Consortium and the related Technology Workforce Development Program have been driving forces behind a new sense of cooperation, collaboration, and best practice sharing among Texas colleges and universities as it relates to engineering and computer science education. It will take the combined energies and efforts of our state institutions of higher education to help increase the number of students graduating with engineering and computer science degrees."*

The program funded a wide variety of strategies (see section *Project Activities and Practices*). Most strategies involve financing student-led mentoring programs or competitive scholarships and improved student retention by improving the curriculum. Strategies also include funding a new departmental program, financing endowed scholarships, or establishing an off-campus facility to help employed students. A large part of the strategies deal with outreach programs to area high schools and community colleges.

After spending the brief remainder of Fiscal Year 2002 preparing for implementation of their programs through curriculum development and lab setup, most departments succeeded with offering new courses, laboratories, and workshops throughout the year and with offering summer camps and related activities in the summer of 2003.

The distribution of the grant money, with partial funding coming at irregular times, created a considerable hurdle for the project leaders to plan ahead. Funding uncertainties for the upcoming biennium prevented the CB from announcing no-cost extensions before late in the spring of 2003. All institutions were finally able to receive no-cost extensions for their TWD projects until August 31, 2004. The projects received 64 percent of the funds for their awarded grants by the end of August 2003 (see section *Funding of Grants*).

This funding situation contributed to missed semester deadlines. As a result, most projects had to scale back by cutting some of their strategies, eliminating particular strategies, or failing to follow through with some aspect of their projects in spite of their best intentions. The no-cost extensions will allow a partial recovery of the missed opportunities in the coming year.

### External Review

In March 2003, the Coordinating Board published the first external review of the program: *"Evaluation of the Technology Workforce Development Grants Program."* The CB posted the review at

<http://www.thecb.state.tx.us/RESEARCH/>.

The review team consisted of Dr. Roger P. Webb, Steve W. Chaddick School Chair and Georgia Power Distinguished Professor, School of Electrical and Computer Engineering,

Georgia Institute of Technology, and Dr. Peter Lee, Associate Dean for Undergraduate Programs and Professor, School of Computer Science, Carnegie Mellon University.

The report includes these “*General Comments:*”

*“The Texas Technology Workforce Development Grants Program is well-conceived, well-administered, and, based on results achieved in only a very short time period since its initiation, seems to be progressing nicely. The participating academic institutions endorse it, and the faculty project leaders are enthusiastically engaged and obviously committed to the goal of technology workforce development. The funding that has been provided to-date appears to have been used wisely and with strong early impact. This is a good program and the State of Texas should be commended for starting it.”*

And the review team recommended the continuance of the program:

*“It is recommended that the program be continued at least at the initially proposed funding levels.”*

TETC followed up on these recommendations by convening “best practice” meetings for project leaders or implementing mechanisms for enhancing proposals and motivating project leaders to submit proposals to federal funding agencies for workforce development projects. TETC scheduled a best practices meeting for the fall of 2003, and encouraged, with success, the submission of proposals to federal grants. TETC also conducted several proposal writing workshops across the state, following another recommendation of this review.

### Funding of Grants

By the end of Fiscal Year 2003, the Texas Engineering and Technical Consortium (TETC) had raised \$2,925,000 in membership cash contributions. Of this, TETC uses 5 percent for its administrative budget. The administrative outlays include twice-annual general meetings with invited guest speakers, grant writing skills workshops across the state, travel for fund raising, and reimbursement of travel costs and honoraria for external reviewers of the TWD program.

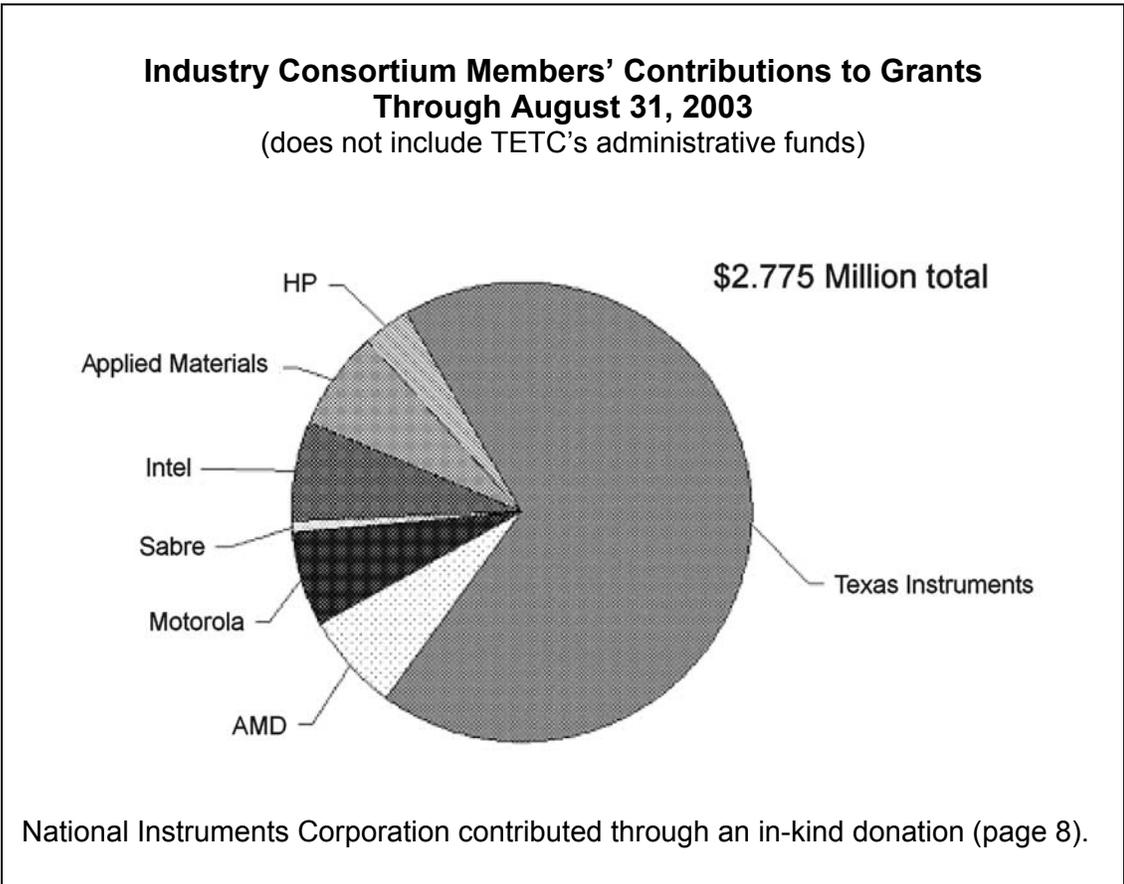
TETC has now seven full members based on a minimum of \$100,000 per year cash contribution or through an equivalent in-kind contribution. Sabre is a contributing partner through American Electronics Association (AeA). Table 3 lists TETC industry members and Figure 1 summarizes the industry’s cash contributions.

Table 4 shows how the Coordinating Board distributed the TETC cash contributions to the institutions throughout the grant period. Roughly one-third of the grants were paid each time, at the end of the spring and summer semesters of 2002 and during the spring semester of 2003. A fourth distribution at the end of summer 2003 lifted the funding level to just over 64 percent. In the end, projects received 10 percent more than the reduced funding level promised at the April 1, 2002 award announcement.

**Table 3**

<b>TETC Industry Members</b> August 31, 2003	
	Texas Instruments, Inc.
	Advanced Mirco Devices
	Applied Materials, Inc.
	Hewlett-Packard
	Intel Corporation
	Motorola, Inc.
	National Instruments Corporation

**Figure 1**



Two TETC member companies responded with in-kind donations in the form of hardware, software, and training. TETC offered the in-kind donations to all TETC academic members on a non-competitive basis. By the end of FY 2003, TETC was in the process of granting and fulfilling applications and delivery. TETC will request state matching funds for these donations, in accordance with the enabling legislation, during the FY 2004.

National Instruments (NI) offered its NI ELVIS platform as in-kind donation in the spring of 2003 (\$316,215 by August 31, 2003), giving the departments time for curriculum development in the summer and allowing for full integration of the donation starting with the fall 2003 semester. NI held free, weeklong professional LabVIEW training classes in Austin. Training was available to faculty, staff, and graduate assistants involved in the integration of LabVIEW and NI ELVIS into the engineering or computer science curricula. Also, NI will make professional training manuals available to all participants.

Grant requirements for the NI in-kind contribution are that the participating departments commit to using the system for a minimum of three years, at least one faculty must attend a training session, and each department must agree to publish its course and lab materials on its website. The value of the average system is about \$30,000 per TETC-member department. The total donation has the potential of carrying a value of \$.5 million to \$1 million.

Texas Instruments followed NI by offering a second in-kind contribution to equip the university laboratories with real-time DSP tools, hardware and software, and teaching materials. TI geared this in-kind donation as leverage and to complement existing TETC projects based on the Infinity Project and/or the NI-donated LabVIEW software. The average university price for the donation is \$16,000 per department with a potential combined donation of up to \$.5 million.

**Table 4**

<b>TWD Grant Funding Distribution</b>		
Timing of fund distribution over Fiscal Years 2002 and 2003		
April 2002:	\$1,465,097.86	1/6 of awards to independent institutions; 1/3 of awards to public institutions
June 2002:	\$19,278.16	1/6 of awards to independent institutions
August 2002:	\$1,415,642.06	Approximately 1/3 of awards to all institutions
March 2003:	\$2,100,000.00	More than 1/3 of awards to all institutions
August 2003:	\$301,051.82	Additional fraction to all institutions
<u>Sum:</u>	\$5,301,069.90	<u>64.3 percent funding of all awards</u>

### Keeping Track of Student Enrollment and Graduation

To study the program's success over time, the Coordinating Board created four enrollment measures for counting electrical engineering (EE) and computer science (CS) students:

<b>E</b>	"entering students"	EE or CS majors in good standing or with a Grade Point Average greater than 2.0
<b>P</b>	"progressing students"	Students with 30-89 hours towards degree, including two courses in science and two in calculus
<b>A</b>	"advanced students"	Students with more than 90 hours towards degree
<b>G</b>	"graduated students"	Students who graduated in the 24-month period prior to the semester of roster taking

After the TWD grants advisory committee reduced the awards to the 54 percent funding level, the institutions projected a combined increase of 1,847 students and an increase of 369 graduates for the funded biennium. This represents a 13 percent projected increase in the number of students in the funded programs.

Table 5 summarizes the TETC student roster from the fall of 2001 to the spring of 2003. The CB posted the complete data for each participating department on its website under <http://www.thecb.state.tx.us/RESEARCH/>.

The departments are graduating students at a higher rate than in the recent past. However, fewer students are entering. This is a reflection of the economic downturn, by which the computer sciences are more hurt (the "dot-com" demise) than the electrical engineering disciplines.

Dr. E. Douglas Harris, Associate Dean of the Eric Jonsson School of Engineering and Computer Science at The University of Texas at Dallas and TWD project leader, summarized the situation:

*"During this severe economic downturn it is extremely difficult to recruit engineering and computer science students. Conventional methods and expenditures employed by most engineering and computer science departments are not adequate to increase enrollments to the levels expected by TETC. Funding from [TWD grants] is very important at this time if we are to meet the future engineering and computer science needs of Texas."*

Entering student counts for a spring semester are always expected to be somewhat below the fall counts because more students typically enter college in the fall.

Most departments first implemented their programs in the fall of 2003, so more time is needed to determine the effectiveness of these programs on enrollment.

**Table 5**

**Summary of Student Rosters From Fall 2001 to Spring 2003**

	Semester	Roster Data by Category				
		E	P	A	E+P+A	G
<b>All departments with a grant</b>	fall 2001	5,484	5,662	4,088	15,234	2,106
	fall 2002	5,317	4,900	4,690	14,907	2,545
	spring 2003	4,013	4,624	5,189	13,826	2,589
	fall 2003					
	GOAL	6,244	6,285	4,673	17,250	2,475
<b>14 computer science departments with a grant</b>	fall 2001	3,065	3,117	2,218	8,400	1,158
	fall 2002	2,687	2,399	2,523	7,609	1,461
	spring 2003	1,800	2,371	2,861	7,032	1,571
	fall 2003					
	GOAL	3,356	3,309	2,435	9100	1325
<b>16 electrical engineering departments with a grant</b>	fall 2001	2,419	2,545	1,870	6,834	948
	fall 2002	2,630	2,501	2,167	7,298	1,084
	spring 2003	2,213	2,253	2,328	6,794	1,018
	fall 2003					
	GOAL	2,888	2,976	2,238	8,102	1,150

Student Categories:

- E – entering students
- P – progressing students
- A – advanced students
- G – gradated students

Definitions of student classifications are in the 2002 Technology Workforce Development Grants Program Announcement (<http://www.thecb.state.tx.us/RESEARCH/>).

### Project Activities and Practices

This section contains the Coordinating Board's summary of the diverse activities funded with TWD grant monies at the participating institutions and departments. The description captures the main thrusts the project leaders have been following and is not comprehensive. The Coordinating Board posts a complete set of all the projects' strategies, 2003 annual reports, and enrollment measures on its web site at <http://www.thecb.state.tx.us/RESEARCH/>, under the link to "Technology Workforce Development Project Summaries – 2003."

#### **Baylor University, Department of Engineering, Infinity Project** **\$24,435**

The department is developing a new course that "*focuses on engineering as a profession, the engineering design process, the nature of various engineering disciplines, team dynamics, a design project...*" Previously, students did not encounter electrical or computer engineering until the fourth semester, by which time the rate of attrition is often high.

#### **Lamar University, Computer Science Department** **\$63,526**

The department offered a new freshmen course *Speaking, Thinking, and Writing in Computer Science* to counteract false presuppositions. The course stresses the importance of math and sciences for computer scientists and demonstrates that students will do more than maintenance and application of packaged software. It also emphasizes the importance of teamwork, and includes discussions of social and ethical issues facing computer scientists. Lamar established a research and mentoring program *Lamar University Women in Computer Science Program (LUWCS)* and a robot lab program for female students *Lamar University Women in Research Development Program (LU WiReD)*. The department produced a brochure and conducted presentations at local high schools.

#### Publications:

1. Doerschuk, P.I., 2003, *Research Experience in Computer Science for Undergraduate Women*. Proceedings of the 2003 International Conference on Information Technology: Coding and Computing, p. 14-19, Las Vegas, Nevada.
2. Ghosn, C., K. Nikitina, K. White, K. White, and K. Williams, 2003, *Research in Autonomous Mobile Robots*. 2003 Lamar University Student Research Conference.
3. Lukose, S.J., M.A. Rahman, R.R.N. Sujir, and S. Sunku, 2002, *Design of an Autonomous Mobile Robot Using a Hybrid Control Architecture*. Lamar University Master's Project Report.

#### **Lamar University, Computer Science Department, Infinity Project** **\$45,656**

The department introduced a new freshman course focusing on electrical engineering instead of general engineering. The class uses the Infinity Project hardware and curriculum. The project leaders find that they can excite incoming students because the lab uses "*actual equipment that electrical engineers in the field use to design any kind of product or device that uses DSP technology.*" However, they find the pure digital signal processing approach too limiting and are working on including other electrical

engineering topics with remaining funds. Upper-level students and graduate students also are using the lab facility productively.

**Prairie View A&M University, Department of Electrical Engineering \$248,084**

The department was able to start a new degree program in *Computer Engineering* with the help of this grant. The Coordinating Board approved the degree program in the spring of 2003. The department is implementing six new courses and laboratories in *Microprocessor System Design, Advanced Logic Design, Communication Network Engineering, and Microcontroller Application*.

**Prairie View A&M University, Department of Electrical Engineering, Infinity Project \$49,900**

The department introduced a new entry-level laboratory course *Fundamentals of Electrical and Computer Engineering* based on the Infinity Project hardware, software, and curriculum. Nineteen of 20 students enrolled stayed with the program, which is almost 20 percent more than typical.

**Southern Methodist University, Department of Electrical Engineering, Infinity Project \$62,180**

The School of Engineering hosted the first, two-day workshop of the *University Infinity Project Professional Development Institute* with 19 participating faculty from other TETC-member departments. The workshop included training on the Infinity Project Technology Kit and instruction on the Infinity Project curriculum, as well as open forum discussions. In addition, the institute hosted two training sessions for 31 high school teachers. The department moved its own Infinity Project laboratory to a permanent location and is developing a new robotics plug-in together with the University of Santa Clara.

**St. Mary's University of San Antonio, Department of Engineering, Infinity Project \$31,940**

The department established its Infinity Project laboratory and offers two new courses for 60 to 80 incoming freshmen. The project leader feels that the new laboratory instruction has *“provided much needed support and guidance for incoming freshmen to adjust to the rigor of these areas and learn about the tools and skills ... such as critical thinking, how to approach an open-ended problem, how to gather information about a certain topic or concept, engineering design process, and how to write and present an executive summary of the work.”*

**Texas State University-San Marcos, Department of Computer Science \$391,932**

The department built a high-tech lab for its newly established computer science degree program at its Round Rock Higher Education Center. The facility makes it easy for professionals in the area to go for continued education. Enrollment has increased sharply since the beginning of the project. Grant funds also allow student hires to

maintain the lab. The project affects four courses at the new facility. Faculty participated in Austin-area government and industry education and job fairs to promote the new program.

**Texas A&M University, Texas Engineering Experiment Station, Department of Computer Science** **\$271,807**

This department's first strategy was to use 27 students as peer teachers for four undergraduate courses. Enrolled students were "*enthusiastic ... on their course evaluations.*" The second strategy involved the employment of 21 undergraduate students who developed introductory level, web-based learning modules which covered, e.g., the Java programming language. Future funds will be spent on upper-level research modules in, for example, mobile computer networking.

**Texas A&M University, Texas Engineering Experiment Station, Department of Electrical Engineering** **\$546,705**

The department started two new courses with this project. A new introductory course, *Practice of Electrical and Computer Engineering*, taught team work project management in a robot laboratory with a competitive game assignment. Lecturers from outside and inside the University gave the beginning students a sense of "*the diverse fields in which the graduates of electrical and computer engineering can contribute to the society and create value for themselves and others.*" This course was an elective but enrollment remained high because nobody dropped out. The department re-designed the second course, *Electrical Engineering Circuits*, to increase student retention. Improvements included a *Design Studio*, the *WebCT - Automatic Homework Submission System*, and the *WebCT Help Desk*, staffed by students. The homework submission system "*provided a unique set of homework for every student and thus they felt very involved with the subject and learned and mastered the subject matter well.*"

**Texas A&M University, Texas Engineering Experiment Station, Department of Electrical Engineering, Infinity Project** **\$37,296**

The department set up a 20-station Infinity Project laboratory.

**Texas A&M University – Kingsville, Department of Electrical Engineering and Computer Science** **\$41,335**

The university's strategies are first to gain new electrical engineering students through outreach to the area high schools and community college and by offering scholarships for the coming fall semester. Further, the department hired eight highly qualified junior and senior students for peer tutoring and set up space for afternoon and evening office hours. Approximately five students per day made use of the help. The department also received a \$400,000 National Science Foundation grant for *South Texas Engineering Scholarships at Texas A&M University-Kingsville*. The project leader writes that the "*...TWD grant was instrumental to obtain the NSF grant.*"

**Tarleton State University, Department of Math, Physics, and Engineering, Infinity Project** **14,799**

Tarleton State's computer science program is less than two years old and the department uses the Infinity Project lab for recruiting students from area high schools and as a tool to gain students from other majors, such as math and engineering physics, for which it is a support field.

**Texas Tech University, Department of Computer Science** **\$125,278**

The department has continued its development on the E-COACH system (Electronic College Optimal Advisor and Career Helper), which is "a holistic, integrated, seamless, self-assessment education tool that recruits students to careers, such as computer science, through the service and awareness that it provides to users from high school through college." It includes the QUICK Scheduler, which can help students manage classroom work, study time, sleep, work, and other activities. The department held one workshop for high school and junior college counselors in the area.

Publications:

1. Gregory, J.M., L.R. Heinze, D.J. Bagert, and S.A. Mengel, 2002, *E-COACH: A Paradigm Shift for Efficient Advising*. 32<sup>nd</sup> ASEE/IEEE Frontiers in Education Conference, Boston, Massachusetts, F4E pages 1-5.
2. Heinze, L.R., J.M. Gregory, and D.J. Bagert, 2002, *Web-Based Automated Assessment for ABET Programs*. 32<sup>nd</sup> ASEE/IEEE Frontiers in Education Conference, Boston, Massachusetts, T1B pages 23-27.
3. Bagert, D.J., J.M. Gregory, S.A. Mengel, and L.R. Heinze, 2002, *Engineering Education Innovation with Software Engineering Projects*. 32<sup>nd</sup> ASEE/IEEE Frontiers in Education Conference, Boston, Massachusetts, S3G pages 13-16.
4. Gregory, J.M., X. Xie, and S.A. Mengel, 2003, *Sleep Management: A Frontier for Improved Academic Performance*. Proceedings of the ASEE Gulf-Southwest Annual Conference, The University of Texas at Arlington, Paper Number ASEE-GSW-gre2.
5. Gregory, J.M., X. Xie, and S.A. Mengel, 2003, *Active and Passive Learning Connections to Sleep Management*. 33<sup>rd</sup> ASEE/IEEE Frontiers in Education Conference, Bolder, CO, T3A pages 1-7.
6. Heinze, L.R., J.M. Gregory, J. Rivera, 2003, *Math Readiness: the Implications for Engineering Majors*. 33<sup>rd</sup> ASEE/IEEE Frontiers in Education Conference, Bolder, CO, S1D pages 13-17.

**Texas Tech University, Department of Electrical and Computer Engineering** **\$204,176**

The department held an undergraduate research program each summer. Students competed for the paid positions with research faculty and had to defend their findings in writing and orally. One student presented a paper at an IEEE International Symposium. The department also used grant money to revamp their course structure for incoming students. Plans of offering the curriculum material as outreach to area high schools

failed because funding was incremental and came too late for the high schools to implement.

**Texas Woman's University, Department of Mathematics and Computer Science, Infinity Project** **\$36,975**

The university installed the Infinity Project lab, one-third of which was grant funded and two-thirds university funded. The department is incorporating the Infinity Project curriculum into six of its computer science courses. Faculty and students are posting on the web all curriculum materials developed under this grant.

**The University of Texas at Arlington, Computer Science and Engineering Department, Infinity Project** **\$72,756**

The department included the Infinity Project laboratory in its freshman introductory computer science and engineering courses. For this it developed its own front end to provide better software visibility. This tool allows the course developer to link curriculum text and lab experiment by highlighting relevant lines of code and making it easy for the student to follow variant parameters exercises.

**The University of Texas at Arlington, Department of Electrical Engineering** **\$197,200**

The department partnered with the Arlington Independent School District and Tarrant County College District-Southeast Campus (TCCD-SE) to implement *Project Lead The Way* (PLTW). The university worked on dual enrollment, transfer policies, and curriculum articulation agreements with TCCD-SE. The department improved freshman courses by including Lego Mindstorm Robotics kits in the curriculum. Due to the initiative of IEEE Student Chapter officers, the department shifted grant money from scholarships to 30 paid mentors and established a new Mentoring and Counseling Office for undergraduate students.

**The University of Texas at Arlington, Department of Electrical Engineering, Infinity Project** **\$57,678**

The department uses the Infinity Project lab for outreach during area recruiting fairs, demonstrations in introductory courses, and for lab experience for electrical engineering majors. Faculty teamed with graduate and undergraduate student mentors teaching the lab. The department is working on using third-party software (e.g. Matlab) to interact with the Infinity Project lab hardware, as well as the addition of daughter cards in an attempt to give the students more opportunity for independent system development.

**The University of Texas at Austin, Department of Computer Sciences** **\$235,858**

The department conducted *First Bytes*, two summer computing camps for girls, with an enrollment of 50 each. The school used grant money to fund both, create a logic-intensive summer course for at-risk students, and support its *Touring Scholar Honors Program* for high-achieving incoming high school students. The summer course improved number of students with grade C or better by almost 20 percent for participants versus non-participants. The department improved the curriculum of seven courses through grant money.

**The University of Texas at Austin, Department of Electrical and Computer Engineering** **\$546,581**

The department increased the number of teaching assistants and adjunct faculty for its 500 incoming students to lower the student/instructor ratio. Improvements to the Electrical and Computer Engineering course included the addition of a team design project with the Lego Mindstorm robots. The students responded enthusiastically to this challenge.

**The University of Texas at Austin, Department of Electrical and Computer Engineering, Infinity Project** **\$59,256**

The department offered the new Infinity Project course *Introduction to Digital Information* (IDI) to its incoming students with a "hands-on" experience that employs modern equipment.

**The University of Texas at Dallas, School of Engineering and Computer Science** **\$446,911**

The engineering department used grant money to bring over 360 potential students to visit its campus in four special events and to increase the school's name recognition. It also created a professional recruiting video. The school hired additional senior lecturers for new summer courses and awarded scholarships to high-achieving freshmen. The project leader says: *"During this severe economic downturn it is extremely difficult to recruit engineering and computer science students. Conventional methods and expenditures ... are not adequate to increase enrollments to the levels expected by TETC."*

**The University of Texas at El Paso (UTEP), Electrical and Computer Engineering Department, Infinity Project** **\$57,873**

The department included the Infinity Project lab and curriculum into several pre-freshman summer orientation courses for UTEP-committed students. It conducted a significant overhaul of pre-engineering seminars and laboratories using the Infinity Project curriculum. Faculty, with the help of paid students, assisted area high schools to adopt and set up the Infinity Project curriculum.

**The University of Texas-Pan American, Electrical Engineering Department** **\$172,450**

The department used grant money for a scholarship program and a job program for mainly incoming students. The project leader noticed that *"... students participating in the job program strategy were performing much better than those under scholarships"* and changed his emphasis toward the former (with the exception for high-achieving students). Student jobs helped lessen the need for off-campus employment and the program paid hourly wages for research, laboratory, and peer tutoring assignments. The department applied for a grant from the National Science Foundation Division of Undergraduate Education (STEP program) to continue the TWD initiative.

**The University of Texas at San Antonio, Department of Computer Science** **\$313,224**

Faculty of the department visited 19 high schools to promote its computer science program and distributed brochures to students of high schools and community colleges. The grant paid for tuition and fees for three special summer graduate courses for high school teachers. The award money also paid for student peer tutors and lab student presenters. With TWD funds, the department built a new Linux lab to serve seven courses in the fall semester.

**The University of Texas at San Antonio, College of Engineering, Infinity Project** **\$57,680**

The department developed a two-semester sequence of courses based on the Infinity Project lab with a new tutorial and employing graduate student teaching help. The school promoted the curriculum among area high schools, one of which committed to the program.

**The University of Texas at Tyler, Department of Computer Science, Infinity Project** **\$28,551**

The department established its Infinity Project lab as a professional development center for high school teachers. It recruited two high schools, whose representatives participated in its *Infinity Project Summer Institute*, to adopt the Infinity Project program, which serves as technical support to these schools. The department also included the Infinity Project lab into its core curriculum for freshmen.

**University of Houston, Electrical and Computer Engineering Department** **\$388,684**

The department conducted two week-long engineering summer camps for girls. Called *Girls Reaching and Demonstrating Excellence in Engineering*, it uses the Lego robot system. *Redshirt Camps* during the spring and summer semesters gave students “*experience using novel problem solving techniques that they can use for any future class, research, and work situation.*” The department reduced its teacher/student ratio with grant money and added workshops to its courses. Camps and workshops relied on paid-student help.

Publication:

1. Shattuck, D.P., F.J. Claydon, S.A. Long, B.J. Barr, J.L. Ruchhoeft, and L.I. Basilio, 2003, *Summer Camp and Course Workshops for Sophomore Level Electrical and Computer Engineers*. Proceedings of the 2003 American Society for Engineering Education Annual Conference and Exposition, Nashville, Tennessee, session number 1432, electronically published paper number 777.

**University of Houston – Clear Lake, School of Natural and Applied Sciences** **\$327,252**

The school established its *Texas Scholars in Computer Science* program by matching its TWD grant money through a challenge grant to UHCL from the *Houston Endowment* for a permanent scholarship fund for transfer students from community colleges. In addition to scholarships, the *Texas Scholars in Computer Science* program provides student mentoring from the project leader.

**University of Houston – Victoria, School of Arts & Sciences** **\$40,635**

The department funded student help for its recruitment and publicity strategy, as well as for mentoring and tutoring for one of its summer classes. The main outreach effort was seven *Open Houses* in the Houston and Victoria areas by which faculty, with student help, reached large numbers of minority students. Advertisement for the events included flyers, brochures, phone calls, e-mails, and even door-to-door canvassing.

**University of North Texas, Department of Computer Sciences** **\$83,322**

The department initiated a new introductory course, exclusively for computer science majors, offering smaller class size and an intensive programming experience for the students from the beginning. The department also established a well- equipped *Help Lab* to provide peer tutoring and technical help to computer science majors. The department increased its presence at the UNT-South Dallas campus with video conferencing and increased faculty office hours.

Conclusions

The Technology Workforce Development Grants Program has completed its first year with funded projects, which received 64 percent of their proposed budgets. The funded departments continue to work on their strategies under a no-cost extension through August 2004.

The institutions reported that they implemented most of the planned new classes, camps, laboratories, and curriculum improvements. There is great enthusiasm that these changes will improve not only the number of graduates but also the quality of the graduates who have participated in the TWD program.

The overall number of students enrolled in computer sciences and engineering is down from the benchmark of fall 2001. The number of entering students is especially depressed, which causes the highest concern. Analysis suggests that only one year of limited funding is not enough to stem the impact of the economic downturn, but the program funds are nevertheless of great importance in keeping the student pipeline in these fields open and primed for a future recovery. The Coordinating Board's external review team of the program observed:

*“Despite current economic conditions that exacerbate the difficulties in obtaining adequate financial support from both industry and state resources, the fundamental goal of expansion of workforce resources in electrical and computer science seems to be obviously important to the Texas workforce and the state’s economy.”*

# TEXAS HIGHER EDUCATION COORDINATING BOARD

## Technology Workforce Development Grants Program

### Advisory Committee

Mr. Torrence H. Robinson, Chair  
Director of Public Affairs  
Texas Instruments, Inc.  
12500 TI Blvd., MS 8656  
Dallas, TX 75243  
214-480-6823; [t-robinson4@ti.com](mailto:t-robinson4@ti.com)

Dr. Moonis Ali  
Professor and Department Chair  
Texas State University - San Marcos  
601 University  
San Marcos, TX 78666-4616  
512-245-3409; [ma04@swt.edu](mailto:ma04@swt.edu)

Mr. Ray Almgren  
Vice President  
National Instruments  
11500 N. Mopac Expwy  
Austin, TX 78759  
512-683-5401; [ray.almgren@ni.com](mailto:ray.almgren@ni.com)

Dr. C. S. Burrus  
Dean of Engineering  
Rice University  
6100 Main Street  
Houston, TX 77005  
713-348-4009; [csb@rice.edu](mailto:csb@rice.edu)

Dr. Bill D. Carroll  
Dean of Engineering  
The University of Texas at Arlington  
701 South Nedderman  
Arlington, TX 76019  
817-272-5725; [carroll@uta.edu](mailto:carroll@uta.edu)

Mr. Tom H. Dickey  
Director and General Manger  
Intel Corporation  
1501 South MOPAC Expressway  
Austin, Texas 78746  
(512) 732-3915; [h.tom.dickey@intel.com](mailto:h.tom.dickey@intel.com)

Ms. Sue Snyder  
Government Affairs Director  
AMD  
5204 East Ben White Blvd.  
Austin, TX 78741  
512-602-4159; [sue.snyder@amd.com](mailto:sue.snyder@amd.com)

Dr. Ben Streetman  
Dean of Engineering  
The University of Texas at Austin  
301 Dean Keaton  
Austin, TX 78712  
512-471-1166; [bstreet@mail.utexas.ed](mailto:bstreet@mail.utexas.ed)

Dr. Valerie E. Taylor  
Department Head  
Texas Engineering Experiment Station  
332 Wisenbaker Engineering Research Ctr.  
College Station, TX 77843-3112  
979-845-5820; [taylor@cs.tamu.edu](mailto:taylor@cs.tamu.edu)

---

#### Coordinating Board Support Staff:

Dr. Reinold R. Cornelius  
Program Director in Research  
THECB  
P.O. Box 12788  
Austin, TX 78711  
512-427-6156;  
[Reinold.Cornelius@theccb.state.tx.us](mailto:Reinold.Cornelius@theccb.state.tx.us)

Dr. Linda N. Domelsmith  
Director of Research  
THECB  
P. O. Box 12788  
Austin, TX 78711  
512-427-6150;  
[Linda.Domelsmith@theccb.state.tx.us](mailto:Linda.Domelsmith@theccb.state.tx.us)