

**ADVANCED TECHNOLOGICAL EDUCATION PROGRAM
1999 AWARDS AND ACTIVITIES**

ADVANCED

TECHNOLOGICAL

EDUCATION

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
Division of Undergraduate Education
Division of Elementary, Secondary, and Informal Education



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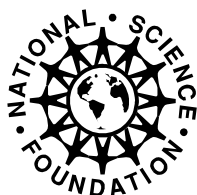


NATIONAL SCIENCE FOUNDATION

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Division of Undergraduate Education
Division of Elementary, Secondary, and Informal Education

**ADVANCED TECHNOLOGICAL EDUCATION (ATE) PROGRAM
AWARDS AND ACTIVITIES
Fiscal Year 1999**

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NATIONAL SCIENCE FOUNDATION

ADVANCED TECHNOLOGICAL EDUCATION (ATE)

OVERVIEW

The ATE program provides grants to strengthen the education of technicians for the high-tech fields that drive the U.S. economy. The program targets both the undergraduate and secondary school levels, and is managed jointly by the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE).

By developing and disseminating educational materials and curricula, supporting the preparation and continuing professional development of college faculty and secondary school teachers, and offering opportunities for both students and educators to gain hands-on experience with technologies used in the modern workplace, ATE projects prepare technicians for rewarding careers in biotechnology, environmental technology, information technology, and a range of other science- and engineering-related fields. The program also supports projects that improve the core science and mathematics courses that technicians need in order to succeed in their area of specialization.

Two-year colleges are expected to play a key role in all ATE projects. Collaborative efforts involving secondary schools, two-year colleges, four-year colleges and universities, businesses and industries, and government organizations are encouraged.

During FY1999, the ATE program supported 11 Centers of Excellence and 164 projects. Centers focus on systemic approaches to technician education, usually within a specific discipline; however, they are also expected to have broad impact on two-year colleges, secondary schools, the region, and the nation. Projects focus on specific aspects of technician education, such as curriculum or educational materials development, faculty or teacher preparation or enhancement, technical experiences for students, or laboratory development. Cooperative efforts among projects and centers assure that the ATE program is having a national impact. In the program's six years of operation, centers account for 27% of fund allocation (\$40.9 million of \$151.5 million), and projects for 65% (\$98.5 million). Based on all awards active in FY1999, official cost-sharing, as pledged in proposals, amounts to 39% of the total NSF funding for the projects and centers; however, annual and final project reports show that grantees are, overall, leveraging NSF funds with other funds better than 1:1.

A. Focus Areas of ATE Projects and Centers

Science-Related Technologies

These projects involve two-year colleges, four-year colleges and universities, secondary schools, businesses and industries, professional societies, and government agencies. For example, the College of the Mainland in Texas is partnering with major petrochemical and refining industries, two-year colleges, and universities to develop and implement an industry-sanctioned standardized curriculum in process technology (Award No. 9950071). Moorpark College in California is developing a model curriculum in biomanufacturing (Award No. 9950099). Gadsden State Community College in Alabama is partnering with three secondary schools to provide technical experiences in aquaculture to high-potential students (Award No. 9950063).

Engineering and Computer Technologies

These projects cooperate with industries and other partners to educate students for the high-performance workplace. Bismarck State College in North Dakota is joining with industry to provide a quality comprehensive curriculum to meet the national need for education of power plant operators (Award No. 9950034). Mott Community College in Michigan is developing a curriculum that integrates manufacturing and simulation skills (Award No. 9950052). Sinclair Community College in Ohio is adapting and implementing an information technology (IT) curriculum (Award No. 9950028) originally developed by the NorthWest Center for Emerging Technologies. Several IT projects have dual enrollments, “2+2+2” opportunities, and teacher education programs.

Core Mathematics and Science

The ATE program supports the development of core curricula that give students the prerequisite mathematics and science skills, as well as SCANS (Secretary’s Commission on Achieving Necessary Skills) competencies, necessary for success in technical programs. Wake Technical Community College in North Carolina is producing a set of integrated activities to supplement mathematics and physics courses for engineering technology programs (Award No. 9950101). Joliet Junior College in Illinois is providing a series of faculty development workshops to help faculty develop a stronger understanding of science and its applications in the workplace (Award No. 9950062). The Consortium for Mathematics and Its Applications (COMAP) is producing a two-semester developmental mathematics course in which the mathematics is embedded in complex realistic examples (Award No. 9950036). A companion project funded by NSF’s Instructional Materials Development program (Award No. 9818961) is developing 35 units for a high school curriculum that emphasizes mathematics in the workplace.

Special Projects

The ATE program continues to support special projects. The American Association of Community Colleges (AACC) is conducting five interrelated activities to encourage the development of ATE-related programs in community colleges, to facilitate networking and joint activities among ATE projects, and to make known to the education field the accomplishments of these ATE projects (Award No. 9908191).

B. Program Effectiveness

Curriculum

Because industry is requiring new skills from graduates, new courses and curricula must be developed. To assure international competitiveness, these curricula must meet internationally recognized benchmarks and standards. All ATE projects and centers located at two-year institutions use industrial advisory boards to assure that curricula are relevant to industry's needs. Materials developed under ATE funding are being widely recognized and used in other programs. For example, TECH SPAN, a newly developed flexible manufacturing curriculum developed for the technical colleges in Wisconsin under an ATE grant (Award No. 9752082), is being used as the curriculum in a newly awarded \$1 million project, funded by the U.S. Department of Labor, to retrain dislocated and incumbent workers for manufacturing technology occupations. The Phi Theta Kappa project carrying out the dissemination of six ATE projects to 13 institutions (Award No. 9602459) reports that 2,038 students are being served in FY1999 by courses using materials developed through the six ATE projects.

Students

ATE projects and centers involve large numbers of students. For example, the NorthWest Center for Emerging Technologies, at Bellevue Community College in Washington, reports that over 2,700 students per year are currently enrolled in IT programs at the nine Washington State community colleges involved in the center. In addition, over 2,000 high school students are using the center's ATE-funded curriculum to prepare them for further use of IT. The Northwest Center for Sustainable Resources, at Chemeketa Community College in Oregon, reports having 537 students in sustainable resources programs, with 124 documented graduates; 94% of these have found jobs or continued their education in sustainable resources fields. Industry is also recognizing students in ATE programs by providing scholarships and internships. For example, the South Carolina ATE Center has recently established an NSF Scholars program at two institutions in cooperation with local industries; 29 companies have agreed to sponsor students as ATE Scholars.

Faculty and Teachers

ATE projects and centers focus on preparing college faculty and K-12 teachers for upgraded courses and programs. The National Center of Excellence for Advanced Manufacturing Education, at Sinclair Community College in Ohio, reports that in the last year, its outreach programs engaged 460 faculty and teachers in professional development activities. Jones County Junior College (Award Nos. 9752060 and 9950085) reports that its workshops have prepared 130 middle and high school teachers and 37 two-year college faculty to teach a new curriculum in computer networking. Most participants have earned CNA (Certified Novell Administrator) certifications. Over 75% of the community college teachers in Virginia and 39% of the high school teachers in Virginia who teach drafting and computer-aided design (CAD) courses have participated in Piedmont Community College's project (Award No. 9752021) to prepare them to teach solid modeling courses, which are now required for most industry positions.

Partnership Development

ATE projects and centers focus on the development of partnerships among two-year colleges, secondary schools, four-year institutions, and business and industry. Prince George's Community College reports that 12 community colleges, along with 10 NASA centers, are actively involved in its project for innovative technology transfer (Award No. 9553662). Boeing, Microsoft, and other software companies in Washington contribute approximately \$1 million per year to the NorthWest Center for Emerging Technologies. This center has also recently formed partnerships with the Gartner Group and AACC for the publication and dissemination of educational materials. A project at the University of New Mexico (Award No. 9850310) involves three universities and three community colleges working extensively with Intel and other semiconductor firms to create a learning environment in which four-year college engineering students and students in two-year technician programs work side-by-side in real-world, factory-like settings.

Evaluation Activities

The evaluators of ATE centers and projects both contribute to the continuous improvement of projects and provide summative evaluations. They also collect data for project reports. For example, the New England Board of Higher Education conducted a comprehensive follow-up evaluation of an ATE project in photonics education that ended last year (Award No. 9553762). The evaluation found that over a period of 30 months, a total of 4,964 students (1,920 from high schools and 3,044 from community colleges) were enrolled in new or extensively revised courses that were taught by project participants and included fiber optics concepts. It is expected that materials developed by ATE projects and centers will be validated by industry and reviewed by academics; that National Advisory Boards or National Visiting Committees will review progress; and that most ATE projects will have an outside evaluator who monitors and reports progress.

With the assistance of the Evaluation Center at Western Michigan University, the ATE program is developing a survey form so that each project and center reports on:

- educational materials, courses, and curricula being developed, modified, or adapted;
- the number of students in programs, courses, and internships in industry, as well as the number who have been placed in jobs;
- the number of faculty and teachers involved;
- partnership development;
- recognition and dissemination activities;
- evaluation activities; and
- other factors that indicate the impact of the project.

Government Performance and Results Act (GPR)

The ATE program contributes to NSF's GPR Performance Goal 3, which calls for "a diverse, globally oriented workforce of scientists and engineers." In a secondary role, the ATE program contributes to Performance Goal 4, which calls for "improved achievement in mathematics and science skills needed by all Americans." Some of the program's achievements with regard to these goals are noted in Section D.

C. Programmatic Issues

Broadening the Impact

A new emphasis in the ATE program announcement for proposals due in 1999 encouraged the adaptation and implementation of high-quality educational materials, novel degree programs, effective educational practices, and thriving partnerships that have been developed by projects supported by the ATE program. The ATE Principal Investigators Conference in the fall of 1999 had the theme “Broadening the Impact” and involved professional societies, publishers, and the press in discussions about informing the broader community.

Articulation to Engineering and Science Majors at Four-Year Institutions

Many two-year colleges are developing ATE programs that incorporate increasing amounts of core mathematics, science, and engineering. These programs are developing articulation agreements with four-year colleges and universities. A new emphasis in the ATE program announcement for proposals due in 2000 encourages “articulation partnerships” that link two-year programs with bachelor’s degree programs.

Cooperation with Other NSF and Government Programs

Many ATE projects and centers leverage Tech Prep and School-to-Work activities to support their projects. ATE program officers regularly participate in forums and other activities of the Departments of Education, Labor, and Transportation and the National Institute of Standards and Technology to learn about other programs that support technician education. In FY1999, several ATE program officers collaborated with the other agencies in exploring technician education in European countries. Representatives from these agencies serve on advisory boards and National Visiting Committees of ATE projects and centers. Principal Investigators from NSF’s systemic initiatives attend the ATE Principal Investigators Conference and communicate with ATE program officers and project leaders. Discussions are being held to link ATE programs and products more closely with other programs.

Increasing Diversity in ATE Projects and Centers

Of the new ATE awards made in FY1999, 40% have indicated a *significant* focus on the education of women, 45% have indicated a *significant* focus on the education of minorities, and 5% have indicated a *significant* focus on the education of persons with disabilities. The “21st Century Urban Technical Education Project” at Milwaukee Area Technical College (Award No. 9950046) is focusing on the recruitment and retention of minorities in Milwaukee’s Central City, on the fringe of the city’s Enterprise Zones. Aiming to attract and retain students in construction education programs, the project is expanding an already successful minority student retention program at the college. The ATE project “The Technological Connection: Computer Training for Residents of Arctic Alaska” (Award No. 9950069) specifically targets native Alaskans through Ilisagvik College in Barrow, Alaska, the northernmost city on the continent. With the assistance of four other community colleges that have experience in developing IT curricula for indigenous populations, the project is developing a curriculum that will meet the needs of local businesses and can be remotely delivered to native villages. Through this program, it is expected that a minimum of one person from each of the seven villages in the region will receive an A.A.S. degree and be hired into an IT position in the region. During FY1999, the NorthWest

Center for Emerging Technologies continued to work with community groups, industry, and other organizations to recruit nontraditional populations into IT. The center collaborated in events with the Women's Community Impact Consortium and the American Association of University Women; in Microsoft's "Diversity Day"; and in a partnership with the Private Industry Council to train displaced workers for IT careers.

D. Notable Achievements by ATE Projects and Centers in FY1999

Projects incorporate international points of reference.

Of the new ATE projects funded in FY1999, 76% have indicated that they have major participation by commercial or industrial organizations. Many private sector supporters of ATE projects are multinational companies, and their participation ensures that projects' products and activities will reflect international standards and practices. The Maricopa Advanced Technology Education Center in Arizona works closely with SEMATECH and major international microelectronics companies (including Intel, Motorola, and SGS-Thompson) to develop educational materials and curricula. These companies also provide internships and other workplace experiences for students and faculty, so that students will be exposed to state-of-the-art practices in semiconductor manufacturing and related areas.

Academia, government, and business recognize the quality of projects or participants.

Approximately 25% of ATE projects have received awards, and numerous participants in ATE projects have received awards for their project-related work. For example, the Illinois Department of Commerce and Community Affairs recognized the Chicago Manufacturing Bridge Program (Award No. 9850327) as the training program of the year. A co-PI on the project "Cross-Training Technicians and Engineers for Semiconductor Manufacturing" at the University of New Mexico (Award No. 9850310) received Motorola's Educator of the Year Award.

Projects encourage the integration of education and research.

ATE projects and centers demonstrate active integration of research and education, as well as cooperation between the research and education directorates at NSF. The Northwest Center for Sustainable Resources cooperates with the NSF Long Term Ecological Research Center run by Oregon State University in the H. J. Andrews National Forest. The Marine Advanced Technology Education (MATE) Center, at Monterey Peninsula College in California, has an internship program funded jointly by the ATE program and NSF's Division of Ocean Sciences. The program allows community college students to serve as marine technician interns aboard ships. In addition, the ATE program and the Division of Ocean Sciences are cooperating in a workshop sponsored by the MATE Center and the Consortium for Oceanographic Research and Education on marine technology and the needs and skills of marine technicians.

Projects positively change employment potential.

A displaced worker, who had to give up his career in retail management because of a hip injury, now manages two Web sites and runs his own small business building and selling computers, thanks to re-skilling he received at the NorthWest Center for Emerging Technologies. Before enrolling in courses at the center, he knew nothing about computers; but now his associate

degree has qualified him for a range of careers, including technical analyst, technical support engineer, information systems analyst, developer support engineer, and software support engineer. Through an education–business alliance, an ATE project at Valencia Community College in Florida (Award No. 9950106) is working to assist institutional efforts to design and deliver a collaborative, replicable “Electronic Workforce Development System” for Central Florida’s microelectronics industry. Outcomes are expected to include increased enrollment, retention, completion, and job placement of students.

Projects engage in the development, adaptation, and implementation of effective models, products, and practices that meet the needs of all students.

As a result of the Fiber Optics Technology Education Project (Award No. 9553762), the number of New England high schools and colleges offering fiber optics instruction increased from 20 to 40. Over the 30-month grant period, nearly 5,000 students received instruction in fiber optics technology. For the past five years, the Advanced Technology Environmental Education Center in Iowa has sponsored annual “fellows institutes” and regional conferences for community college and high school faculty members. In response to a 1999 survey, fellows indicated that they had already had a real impact on 18,000 students with the information and activities from the summer institutes. During the past five years, regional conferences for faculty have been held in 24 states, with 2,322 participants. During 1998, the ATE center at Sinclair Community College reported that the number of Sinclair students declaring manufacturing engineering technology as their major increased by 54%. The Southwest Center for Advanced Technological Education, at Texas State Technical College, Sweetwater, has focused on developing a distance learning infrastructure to serve rural and remote areas. The number of courses delivered via the center’s distance learning network increased from four in the spring of 1997 to 31 in the fall of 1998. The number of students served by the network increased from 55 in the spring of 1997 to 631 in the spring of 1999. Because of funding leveraged from other sources, it is expected that the number of interactive television classrooms in the network will increase from 25 at the end of 1998 to 300 by the end of 1999.

Project participants experience world-class professional practices in research and education.

At the four-day US-EURO-NET (United States–European Network for Education and Training) Trans-Atlantic Conference and Workshop on “Education and Training in Rising Career Fields” in April 1999, about half of the American educational projects profiled were ATE-funded projects. This conference brought together educational leaders from Austria, Denmark, Germany, Great Britain, and the United States to compare standards and content for technical education programs, especially in IT and environmental technology. Investigators from the ATE project “A Bridge to Advanced Technological Education” (Award No. 9850327) are sharing the results of their work with groups in five European countries (Austria, France, Germany, Great Britain, and Italy), as participants in a European Union-funded program aimed at developing educational materials for workers in the fast-changing technological workplace. The investigators note that “the Europeans are grappling with very similar sets of issues, thanks to globalization and technological change.”

E. For More Information

For more information about the ATE program or awards, visit one of the Web sites listed below or contact one of the lead program directors for the ATE program:

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NSF Web Sites of Interest

Directorate for Education and Human Resources	http://www.ehr.nsf.gov/
Division of Undergraduate Education	http://www.ehr.nsf.gov/EHR/DUE/
Division of Elementary, Secondary, and Informal Education ...	http://www.ehr.nsf.gov/EHR/ESIE/
Award Abstracts	http://www.nsf.gov/verity/srchawd.htm
Project Information Resource System	http://www.ehr.nsf.gov/PIRSWeb/Search/
ATE Centers of Excellence	http://www.ehr.nsf.gov/EHR/DUE/awards/ate_centers.asp

CENTERS OF EXCELLENCE

Renewed Awards (1999)

In 1999, no new ATE centers were established; but two centers, established in 1996, were awarded funding for a second three-year term. The map on page 28 shows all 11 ATE centers that were active in 1999.

Award No. 9908409

S.C. State Board for Technical and Comprehensive Education

South Carolina Advanced Technological Education Center of Excellence

Award: \$2,000,000
(FY1999 \$760,000; FY2000 \$650,000; FY2001 \$590,000)

Engineering Technology

Elaine Craft
S.C. State Board for Technical and
Comprehensive Education
111 Executive Center Dr.
Columbia, SC 29210

crafte@sbt.tec.sc.us
(803) 896-5410

The South Carolina Advanced Technological Education Center of Excellence is a statewide systemic initiative designed to increase the quantity, quality, and diversity of engineering technology graduates throughout the state's 16 technical colleges. An integrated, problem-based curriculum, collaborative teaching strategies, active learning techniques, and faculty and student teamwork form the cornerstone of the center's strategy to recruit, retain, and graduate more students in engineering technology programs.

The key to the center's success continues to be reform-ready faculty acting as agents of change to develop and deliver innovative engineering technology curricula and to promote program improvement. The center has proven the effectiveness of exemplary faculty leading grassroots reform.

Four activities lie at the heart of the center's work: (1) continuing development of pre-engineering technology and first-year engineering technology curricula; (2) faculty development that supports effective teaching methodologies and creates learning environments that model the workplace; (3) recruitment and retention of students, particularly women and minorities; and (4) development of a statewide model to create a seamless array of educational opportunities for students to become well-qualified engineering technology graduates.

Award No. 9908419

Maricopa County Community College District

Maricopa Advanced Technology Education Center

Award: \$2,000,000
(FY1999 \$1,450,000; FY2001 \$550,000)

Semiconductor Manufacturing

Michael Lesiecki
Maricopa County Community College
District

lesiecki@maricopa.edu
(480) 517-8650

Maricopa Advanced Technology Education Center
2323 W. 14th St.
Tempe, AZ 85281

The Maricopa Advanced Technology Education Center (MATEC) has fostered the development of work-relevant, industry-endorsed curricula and instructional modules for use in community college programs primarily in semiconductor manufacturing. The modules include necessary background science and mathematics. Over 100 modules in 19 clusters permit faculty to customize their courses. The courses provide an integrated, accessible professional growth system that ensures currency and relevance to local industry. The instructional delivery system uses virtual reality both in an observing mode and in an interactive mode to educate technicians in clean room practices and instruments.

The center seeks to become a self-sustaining entity working with SEMATECH and the Semiconductor Industry Association for education and workforce development. Activities include the development and distribution of curricula and instructional materials, promotion of faculty development opportunities, and participation in Web commerce. The center has programs for high schools to encourage a more diverse population to seek employment in the semiconductor and supporting industries. The center is also investigating certifications for semiconductor manufacturing technicians.

PROJECTS

New Awards (1999)

Most projects have a duration of two or three years; many of these receive all their funds during the first year (FY1999). The anticipated expiration date for the awards can be found in the index of active and new awards by field of technology, which begins on page 31.

Award No. 9907986

Bellevue Community College

Washington State Information Technology Workforce and Education Initiative

Award: \$300,000
(FY1999 \$185,500; FY2000 \$114,500)

Information Technology

Neil R. Evans *nevans@bcc.ctc.edu*
Bellevue Community College (425) 373-4227
NorthWest Center for Emerging Technologies
3000 Landerholm Cir., SE, N258
Bellevue, WA 98007-6484

This is a statewide, collaborative project to examine and quantify information technology (IT) workforce demands and to seek expedient, cost-effective solutions. The NorthWest Center for Emerging Technologies (NWCET) and its partners are identifying and cataloguing Washington state's IT workforce demands, as well as available IT educational programs. This gap analysis will lead to the development of new IT programs and, with state support, to the strengthening and updating of existing programs. The project will also lead to "turnkey" solutions that allow educational institutions to rapidly launch or enhance IT programs.

The project is accelerating the rate and expanding the impact of the work of the NWCET and the Regional Advanced Technology Education Consortium. The result will be a nationally adaptable, statewide model for replicating "best practices."

Award No. 9908191

American Association of Community Colleges

Advancing ATE in the Community College Field

Award: \$974,949
(FY1999 \$311,018; FY2000 \$341,436; FY2001 \$322,495)

Multidisciplinary

Lynn Barnett *lbarnett@aacc.nche.edu*
American Assn. of Community Colleges (202) 728-0200
Dept. of Education and Training
One Dupont Cir., NW, Suite 410
Washington, DC 20036

This project consists of five interrelated activities designed to enhance the ATE program, to encourage the development of ATE-related programs in more community colleges, and to make known to educators and the public the accomplishments of these programs. The activities support the emerging network of community colleges dedicated to improving undergraduate science, mathematics, engineering, and technology (SMET) education.

Project activities include (1) three national ATE conferences in 1999, 2000, and 2001; (2) dissemination of information about ATE programs and goals through AACC publications, presentations, feature stories, conference proceedings, an e-mail distribution list, and a Web page; (3) a mentoring program to help community colleges strengthen SMET programs; (4) two AACC Research Briefs addressing areas of interest to all community colleges seeking to sustain strong SMET programs; and (5) project evaluation.

Award No. 9950006

Texas Engineering Experiment Station

Two-Year College Quantum Optics Advanced Technological Education Program

Award: \$705,616

Physics

Robert B. Clark *rbc@tamu.edu*
Texas A&M University (409) 845-3332
Dept. of Physics
College Station, TX 77843-4242

This project combines the resources of a major international center for quantum optics and technology with a successful

collaboration of two-year college faculty members who have developed and administered an effective national faculty development program for two-year college physics faculty over the past eight years. The project engages 40 two-year college faculty members in annual two-week institutes and semiannual follow-up workshops. Participants receive a combination of tutorials on recent discoveries in quantum optics, hands-on experience with the new tools of this recent technology in the laboratories of the research center, and pedagogical training in active learning techniques designed to maximize students' understanding of the scientific principles that provide the foundation for these emerging technologies.

Award No. 9950011
Miami University Middletown
Increasing the ImPACT
Award: \$800,000
Chemical Technology

Arlyne M. Sarquis *sarquiam@muohio.edu*
Miami University Middletown (513) 727-3278
Dept. of Chemistry and Biochemistry
4200 E. University Blvd.
Middletown, OH 45042-3458

Miami University Middletown and the Partnership for the Advancement of Chemical Technology (PACT) are conducting a three-year project that expands national efforts to improve and increase access to chemical technology education. The project involves three major activities: (1) offering faculty development, including 10 workshops serving 200 educators; (2) developing curricular materials, including two monographs and one CD-ROM; and (3) implementing strategies to attract and retain chemical technology students, such as PACT forums, a career brochure, a technician-in-residence program, and an award program for student projects. To carry out these activities, PACT is marshaling the combined talents, experience, and expertise of recognized leaders in chemical technology education, the chemical industry, and professional societies.

Award No. 9950015
Cuesta College

**California Regional Consortium for Engineering
Advances in Technological Excellence
(CREATE)**

Award: \$494,916
(FY1999 \$203,733; FY2000 \$167,284; FY2001 \$123,899)
Engineering Technology

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San Luis Obispo County Superintendent (805) 546-3264
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Highway One
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The California Regional Consortium for Engineering Advances in Technological Excellence (CREATE) is a joint effort of seven community colleges and over 70 employers. Through this project, the consortium is developing two- and three-year programs that begin with a common core curriculum in engineering technology. Each campus will then offer two to five advanced technological specialties. Students from any participating college will be able to transfer to any other college in the consortium. This unique regional approach allows the consortium to (1) revise science, mathematics, engineering, and technology curricula; (2) serve the needs of all students, including low-income students and students from underrepresented groups; (3) grow with industry and meet future needs of the high-performance workplace; (4) provide advanced training and retraining to current industry employees; (5) enhance the status of engineering technology education; and (6) nurture new teaching methods in the classroom and laboratory.

Award No. 9950019
SUNY Onondaga Community College

**Designing a Pre-Technology Program Using an
Interdisciplinary Approach and
Work Keys Assessment**

Award: \$449,725
(FY1999 \$201,135; FY2000 \$248,590)
General Technology

Ramesh S. Gaonkar *gaonkarr@sunyocc.edu*
SUNY Onondaga Community College (315) 469-2450
Dept. of Electrical and Computer Engineering Technology
Syracuse, NY 13215

This project to develop a pre-technology program is employing an interdisciplinary approach, using real-life illustrations from industry and appropriate technology, forming learning communities that emphasize collaborative learning, assessing

students' learning using work keys criteria, and recruiting underrepresented high school students into ATE programs. The project brings together three community colleges, three area high schools, and local industries led by United Radio.

The project's key component is a one-semester integrated program. Its focus is a cluster of interdisciplinary, modular courses that develop electronic skills, mathematical skills, composition skills, and computing skills. Other components include internships in industry, teacher education, and career awareness sessions.

Award No. 9950025

Collin County Community College

**Advancing Careers in Technology and Science
(ACTS)**

Award: \$847,785

(FY1999 \$350,195; FY2000 \$323,370; FY2001 \$174,220)

General Technology

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Collin County Community College, North Central Texas College, Grayson County College, the University of North Texas, and area Tech Prep consortia that serve over 40 high school districts and 80,000 students are collaborating in this project. Its primary goals are to initiate community-based campaigns promoting a new mind-set that recognizes the value of 21st-century high-tech technicians and to revitalize mathematics and science curricula by interlocking practical applications of technologies in secondary and postsecondary education. Processes, curricula, and program materials are being disseminated through state presentations, regional workshops, and interfaces with national partners.

The project employs several unique practices. A vertical marketing initiative is promoting the new era of "gold collar" technicians. Designed by and for all the partners, the project is expanding student awareness and opportunities. Multi-level curriculum design teams, composed of faculty from high schools, community colleges, and universities and representatives from various industries, are reducing duplication of subject materials and developing Tech Prep programs with true multi-exit career paths. Nontraditional faculty exchanges provide the vital connection for the integration of Tech Prep programs and college courses. One-week mini-exchanges between secondary and postsecondary faculty and between faculty at different institutions promote understanding among participants. High school teachers see more clearly what their students must be prepared to do. Internships that allow faculty not only to work in industry but also to teach in corporate

training environments expose these educators to current advances in industry and different methods of curriculum delivery and instruction.

Award No. 9950028

Sinclair Community College

**Community College Information Technology
Network**

Award: \$856,583

(FY1999 \$298,230; FY2000 \$282,334; FY2001 \$276,019)

Information Technology

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Sinclair Community College is addressing the shortage of information technology (IT) technicians by working with local industry to develop curricula that educate students in rapidly changing competencies needed for the workplace. The project integrates IT curricula from high school through the associate degree, with an emphasis on using IT skill standards and implementing instructional materials developed elsewhere. Building on fundamental IT skills and employability skills, the project is providing specialties in networking and telecommunications, Web technologies, and programming and analysis. Through a "fast track" certificate program, students obtain work experience and an advanced skill set in programming and analysis. The project is also providing employable IT skills to the visually impaired and offering professional development opportunities—including industrial experience and short courses in pedagogy and content—to both full-time and part-time faculty.

Award No. 9950029
University of Cincinnati

An Evolving Program to Prepare Information Technologists in Southwest Ohio for the 21st Century

Award: \$853,640
(FY1999 \$316,347; FY2000 \$272,665; FY2001 \$264,628)

Information Technology

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This project aims to provide a “2+2+2” seamless transition for students from their junior year in high school, through an associate degree, to a B.S. degree in information engineering technology at the University of Cincinnati. The project has four main components: (1) articulation agreements between partner institutions, (2) course and curriculum development, (3) professional development for faculty (through a series of summer institutes and workshops), and (4) industrial co-op and internship experiences for students. Industrial partners play a crucial role in the project by informing the educational institutions about IT skills desired in workers and providing co-op and employment opportunities for students.

An IT competency profile, developed under the guidance of the Ohio Information Technology Task Force, underpins course and curriculum development at all levels. This IT competency profile follows the Tech Prep model and is the product of extensive collaboration between technical and academic educators and industrial partners.

Award No. 9950034
Bismarck State College

Energy Technology Education Project

Award: \$611,969
(FY1999 \$243,832; FY2000 \$183,365; FY2001 \$184,772)

Energy Technology

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Bismarck State College and the Electrical Power Research Institute Simulator and Training Center are combining resources and expertise to provide a quality comprehensive curriculum that will meet national needs for the education of power plant operators. Simulation packages and hands-on learning experiences are being integrated into the program. Two specific goals of the project are (1) to strengthen science,

mathematics, and technology curricula and instructional materials supporting energy technology education, and (2) to increase the number of students within the region—especially women, Native Americans, and other minorities—who acquire the technical skills needed for employment in the energy industry.

Award No. 9950036
Consortium for Mathematics and Its Applications

Developmental Mathematics and Its Applications (DevMap)

Award: \$674,677
(FY1999 \$225,050; FY2000 \$317,274; FY2001 \$132,353)

Mathematics

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Students who attend two-year colleges often arrive on campus lacking the basic skills necessary to succeed in college-level work. This is a particularly serious problem for students in science, mathematics, engineering, and technology (SMET) programs, who may have significant deficits in their mathematics backgrounds but high aspirations for future success. These students need to build both their mathematical skills and confidence in their ability to solve challenging problems. To address these issues, this project is developing a two-semester program, “Developmental Mathematics and its Applications” (DevMap), which offers an alternative approach to the elementary and intermediate algebra courses currently taught at most two- and four-year colleges.

Industry representatives often emphasize the need for “systems thinking” that enables employees to recognize complexities inherent in situations subject to multiple inputs and diverse constraints. Science-based fields such as agricultural biotechnology require technicians who are able to formulate a problem in terms of relevant factors and design an experiment to determine the influence of those factors. Yet most developmental programs in mathematics, at both two- and four-year colleges, only offer students a replication of the high school mathematics curriculum. Both the National Council of Teachers of Mathematics (NCTM) Standards (1989) and *Crossroads in Mathematics: Standards for Introductory College Mathematics Before Calculus*, published by the American Mathematical Association of Two-Year Colleges (1995), advocate an integrated approach to mathematics content. To address these recommendations, the DevMap approach offers several benefits. The program is not divided into topics called algebra, geometry, intermediate algebra, and trigonometry, although all the major concepts in those courses are covered.

The applications-based curriculum appeals to mature students who choose to pursue postsecondary education because the applications are drawn from areas in which students may find themselves working or from situations that they recognize from their daily lives. Solving the problems posed in DevMap calls for integrating technology in a natural way as compared to the “drill-and-practice” use of technology currently found in many developmental mathematics programs.

Award No. 9950037
Moraine Valley Community College

**Applied Internet Technology:
Curriculum and Careers**

Award: \$315,792
Information Technology

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This project addresses industry’s need for technicians with a specialized degree in applied Internet technologies and answers the need for an integrated information technology (IT) curriculum articulated from high school through the community college to the university level. By including an option for dual enrollment, students least-served by higher education have an opportunity to train in this high-demand occupation while still attending high school. The project provides in-depth training for high school teachers in this new field so that they, in turn, can provide high school students with appropriate training. In addition, the project provides activities designed to increase high school students’ knowledge of information technology careers and the education required for them.

The project’s outcomes include (1) a series of nine courses for a new A.A.S. degree in applied Internet technology; (2) a dual enrollment course with an accompanying instructor’s guide and student lab manual, both with interactive CD-ROMs; (3) workshops on curriculum development and curriculum delivery using technology; and (4) articulation of the A.A.S. degree to Illinois public universities.

Award No. 9950039
Global Wireless Education Consortium

Wireless Industry and Education Collaboration

Award: \$248,616
Telecommunications

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Explosive growth in the wireless areas of cellular and digital personal communications services over the past few years has been shadowed by a decrease in the availability of educated workers. At the heart of a wireless technician’s and engineer’s education is basic radio frequency (RF) knowledge. With educational budget constraints, these were exactly the lower-enrollment courses that were cut during the escalation of computer science courses. The mission of the Global Wireless Education Consortium (GWEC) is to develop a two-year educational platform that produces technicians for the wireless industry. This project is developing and disseminating curricula, online education, and industry resource guides.

GWEC was founded by Motorola, Lucent Technologies, Ericsson, AT&T Wireless, Northern Telecom, and AirTouch Communications, in partnership with the University of Texas at Dallas, Minnesota State University, and South Central Technical College (North Mankato, MN). Current members include the University of Massachusetts at Lowell, the University of Oklahoma, Seattle Central Community College, California Polytechnic University, Ridgewater Community College (Willmar, MN), Michigan Technological University, Connecticut Community Colleges, and Washington State University.

Award No. 9950042
Southeast Community College

**Assignment Chemical Technology–III
(ACT–III)**

Award: \$375,000
Chemical Technology

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Southeast Community College, in partnership with the University of Nebraska, Montana State University, Texas State Technical College, and the DuPont Company, is enhancing chemical technology education programs in two-year colleges by building on two previous ATE projects, called “ACT-I” and “ACT-II.” The new project completes the development of

analytical chemistry coursework begun in "ACT-II" and also addresses organic and biochemistry courses. The analytical and organic chemistry courses embody the heart of chemical technology education in the United States and are the primary vehicle by which the American Chemical Society's Voluntary Industry Standards (VIS) are being implemented. This project utilizes the VIS heavily and is generating a variety of useful products—including a number of modules and monographs covering topics appropriate to these courses; a series of innovative laboratory activities for students; two interactive multimedia programs on CD-ROM modeled after the popular "I.O.N.S." concept utilized in the previous projects; distance education models for these courses; and model "2+2+2" articulation agreements. The project also involves faculty enhancement workshops, as well as research to create and practice various distance education models.

Award No. 9950046

Milwaukee Area Technical College

**21st Century Urban Technical Education Project:
Construction Technology Systems for Grades 11–14**

Award: \$1,095,684

(FY1999 \$321,900; FY2000 \$417,055; FY2001 \$356,729)

General Technology

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This is a three-year project to prepare technical high school students for career opportunities through a "2+2+2" program. Focusing initially on the construction trades, the project is developing an integrated technical education model, which includes teacher preparation, faculty development, attention to diversity, and the integration of technology into interdisciplinary curriculum modules. The project also provides internships and other experiential learning opportunities. It draws upon other projects funded by the ATE program and the Teacher Enhancement program.

Award No. 9950051

Partnership for Environmental Technology Education

**Faculty Associates in Science and Technology
Leadership Corps Project for Enhancing
Environmental Technology Education**

Award: \$600,328

Environmental Technology

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This project constitutes a revised version of a previously successful professional development program for faculty from two-year colleges. The new project will serve a new cohort of 70 to 100 faculty for each of three years. Activities occur in three phases: (1) Curriculum 101, a workshop providing an introduction to "macro" and "micro" issues in science and technology education; (2) a four- to eight-week summer internship in industry, a national laboratory, or a federal or state regulatory agency; and (3) an experience in course and curriculum design, developing a new course or revising an existing course.

The new project rests on a sound foundation of program components developed and evaluated in its precursor. Data from the first project support the conclusion that the approach is a viable model for faculty development and will have nationwide impact on environmental technology education.

Award No. 9950052

Mott Community College

Manufacturing Simulation Technology Project

Award: \$500,738

Manufacturing

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A major challenge facing today's manufacturing industry is the timely delivery of quality products to consumers. What is required is the use of technological tools and simulations to shorten the design and delivery cycle of new products.

This project supports the development and dissemination of a curriculum that integrates manufacturing and simulation skills to prepare technicians for the 21st-century workforce. This curriculum provides model solutions to technical problems in real-life settings and incorporates advanced mathematics and science components throughout a newly developed

manufacturing simulation technology (MST) associate degree program. The project is creating workplace experiences for manufacturers to hire MST graduates from diverse backgrounds. The new program's architecture has been developed at Sinclair Community College's National Center of Excellence for Advanced Manufacturing Education and features a competency-based, modularized format. The focus for this project is robotic simulation.

The project is supplying skilled workers to support the emerging manufacturing simulation technology industry and is providing new career opportunities for women, Hispanics, African Americans, and disabled persons. Faculty are being trained in the use of simulation technology, integrating technology into the curriculum, and pedagogy. A virtual electronic library supports and distributes MST curricula, including a repository of simulation applications.

Award No. 9950053

J. Sargent Reynolds Community College

Advanced Technological Education for Emerging Microtechnologies: The Microchip and the Biochip

Award: \$71,873

Biotechnology

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The emerging technology of the biochip—a microchip that contains DNA—including both its production and its use as a diagnostic tool, presents a unique opportunity for advanced technological education programs. The similarities in the production process between the biochip and the microchip place the proposed biochip curriculum directly in parallel with programs that already exist for microelectronics and electronics. Currently, there are no comprehensive programs at the community college level to address workforce development needs, competencies, and skills for the biochip industry, although these gene chips are already in production at several companies and in limited use in the medical profession.

This pilot project brings together national academic and industrial experts in biotechnology, biochip technology, and microchip technology to build the foundation for a biochip science and technology curriculum that interfaces with existing microelectronics, electronics, and engineering programs offered at many colleges. Activities that support the development and dissemination of this unique biochip specialization are (1) travel to biochip and microchip industries and biotechnology firms in Arizona, California, and Texas to meet experts involved in these industries and to invite them to join this project as part of a curriculum development team; (2) sponsorship of a workshop, "Bioelectronics, Biosensors,

and Biochips," for community college faculty from the three community college systems involved in the project; and (3) sponsorship of other workshops to delineate competencies, skills, and workforce development needs in the biochip industry and to produce biochip specialization courses.

Award No. 9950056

Essex Community College

Internet and Multimedia Technology (I/MMT): Curriculum, Faculty, and Workforce Development

Award: \$272,000

Multimedia Technology

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In this project, the Community College of Baltimore County is implementing a new certificate and associate degree program with tracks in Internet and multimedia technology. This program prepares students for entry-level employment, provides opportunities for workers to upgrade or acquire technical skills, and prepares students for further education in articulated four-year programs. Students in the new program are immersed in a rich information technology environment for general education courses as well as for their major field. To this end, a multimedia laboratory is being created and laboratory manuals are being developed for courses in the new program. The college is working with Baltimore area high schools to develop an articulated curriculum so that students entering the Internet and multimedia tracks will have the necessary foundation in mathematics, science, and written and oral communications. Local four-year institutions, including some with predominantly female or minority populations, are participating in cooperative arrangements to facilitate the transfer of students from this innovative program. The project also supports professional development for faculty and collaborates with business partners to provide internships and co-op experiences for faculty and students.

Award No. 9950057
Peralta Community College District Office
Bioscience Education-to-Employment

Award: \$749,998
Biotechnology

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Laney College, Berkeley Biotechnology Education, Inc., and 35 San Francisco Bay area health and bioscience companies have formed a dynamic partnership with two local high schools and California State University, Hayward, to educate urban youth for entry-level positions in the biotechnology field. This program has received major contributions of time, money, and equipment from industry partners to ensure the success of students in school and in the workplace.

The ATE project builds on the existing model to increase student enrollment and modifies the curriculum to make it more responsive to industry's needs. This three-year project (1) establishes a working bioscience process laboratory that integrates industry personnel in training underrepresented students in relevant laboratory skills; (2) expands student enrollment in the biotechnology program to all interested students, in addition to students in the current high school programs; (3) increases industry involvement by creating additional co-op jobs and new industry co-teaching roles; (4) provides additional support in recruitment and retention to increase the number of qualified program graduates by 50%; (5) evaluates obstacles that students encounter during recruitment and education and after graduation; and (6) disseminates this model by means of manuals that detail the establishment of school-industry partnerships supporting technical education.

Award No. 9950059
Gadsden State Community College
Project DAWN:
Developing Alabama's Workforce Now

Award: \$199,977
Manufacturing

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Project DAWN ("Developing Alabama's Workforce Now") is a partnership between Gadsden State Community College, Central Alabama Community College, Alabama Southern

Community College, and three manufacturing centers of the Alabama Technology Network. The project's goal is to produce a new A.A.S. curriculum in manufacturing technology with four specialty options: electronics; industrial machine and tools; textile and apparel; and forestry, paper, and chemical. Four curriculum manuals—one for each specialty—will be produced. The project involves (1) the assessment of manufacturing technology needs in Alabama; (2) the investigation of exemplary manufacturing technology programs; (3) the development of a model curriculum in cooperation with local industries; and (4) evaluation and dissemination of the results.

Award No. 9950062
Joliet Junior College
TYC Physics Workshops for the
Twenty-First Century

Award: \$305,000
Physics

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The task of updating physics programs at two-year colleges is difficult because of the many rapid changes, the distribution of physics teachers, the heavy and complex workload of the faculty, and their lack of knowledge about the needs and applications of physics in the workplace. This two-year national pilot program is providing a series of six faculty development workshops (three each year) for two-year college faculty who teach the diverse, talented groups of students found in the core physics courses for technology programs and other programs. These workshops acquaint participants with the integration of technology and active learning strategies into such areas as microcomputer-based laboratories, digital video, modeling, computer simulations, qualitative and conceptual exercises, Internet-connected courses, cooperative and collaborative group work, and research and assessment in student learning. In addition, the workshops help faculty to better address the educational and workforce needs of technicians as they relate to physics. The workshops are led by two-year college physics professors along with four-year college or university physics professors who are experts in developing or implementing these approaches. The impact of the workshops is being reinforced by a newsletter and other incentives to encourage the implementation of the workshop ideas.

Award No. 9950063

Gadsden State Community College

**Integrating Aquaculture Technologies in
Secondary and Two-Year Schools**

Award: \$47,682

Aquaculture

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Aquaculture is the fastest-growing segment of the U.S. agriculture industry. Although aquaculture curricula exist, few secondary or two-year educational programs introduce students to the field and its career opportunities. Of the existing programs, few provide students with the hands-on laboratory experiences necessary to meet industry standards for skilled technicians. One goal of this project is to develop an educational partnership between Gadsden State Community College and three Alabama secondary schools in order to provide experiences in aquaculture for high-potential students. Faculty from Gadsden State and Auburn University are providing technical expertise to the secondary schools so that they can set up and maintain demonstration aquaculture systems (mini-fish farms). Gadsden State is also developing a partnership with Auburn University and local industry to offer educational experiences in aquaculture for secondary school and two-year college students and secondary school teachers. This partnership is (1) introducing technical curricula at secondary schools and two-year colleges, (2) providing information to students about potential careers in aquaculture, and (3) giving students an opportunity to participate in the "Intern and Learn" program, which places students on working fish farms. The project's methods and materials are being disseminated to other secondary schools and two-year colleges in Alabama that have recently been encouraged by the aquaculture industry to begin aquaculture programs.

Award No. 9950067

Berkshire Community College

**Western Massachusetts Advanced Technology
Training Consortium**

Award: \$300,000

Multidisciplinary

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Composed of postsecondary institutions (Berkshire and Greenfield Community Colleges), secondary schools, government agencies, and several manufacturing and technology networks, the Western Massachusetts Advanced Technology Training Consortium is developing, field-testing, and implementing learning modules to enhance understanding of environmental and agricultural technology, plastics and paper manufacturing, and computer animation, and to improve mathematics, science, computer, and problem solving skills. The modules are designed to accommodate the needs of diverse audiences by providing learning tracks suited to the specific learning styles, developmental levels, competencies, and skill proficiencies of the various target groups. To disseminate the modules, the consortium is collaborating with the Northeast Center for Telecommunications Technologies at Springfield Technical Community College.

Award No. 9950069

Ilisagvik College

**The Technology Connection:
Computer Training for Residents of Arctic Alaska**

Award: \$308,764

Information Technology

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Using a mobile computer lab and other distance delivery strategies, this project links residents of remote villages on Alaska's Arctic Slope with a two-year A.A.S. program in information technology (IT). Assisted by five partner institutions with established IT curricula, Ilisagvik College (located in the northernmost city on the continent) is tailoring IT courses worth 30 credits to meet the needs of local employers, to address pedagogical issues specific to Alaska Natives, and to provide the best mix of distance delivery strategies. Courses are being pilot-tested on campus before being implemented in the region's seven remote villages. Project personnel expect that at least one resident from each of the villages and 10

Barrow residents will complete the A.A.S. degree and be hired into IT positions in the region.

Local public agencies and private businesses are partnering with the college to provide classrooms in the villages and hands-on training opportunities. Five academic partners are sharing their IT curricula and expertise: Diné College, Maui Community College, Santa Fe Community College, the University of Alaska at Fairbanks, and Nunavut Arctic College.

Award No. 9950071
College of the Mainland

**Consortium for the Advancement of
Process Technology
(CAPT)**

Award: \$898,493
(FY1999 \$392,726; FY2000 \$308,256; FY2001 \$197,511)

Chemical Technology

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The College of the Mainland, in partnership with major petrochemical and refining companies, two-year colleges, and four-year universities of the Gulf Coast region of Texas and Louisiana (the Gulf Coast Process Technology Alliance), is developing an industry-driven, standardized curriculum in process technology. This project builds upon significant accomplishments of the Gulf Coast Process Technology Alliance, including the finalization of competencies for eight common core courses in process technology. These common core courses are required for all newly approved programs in Texas that implement the A.A.S. degree in process technology, and the courses have recently been adopted by Louisiana. Other states, such as Kentucky, Oklahoma, Tennessee, and West Virginia, also support the Alliance's effort to develop an industry-sanctioned curriculum in process technology and are actively pursuing the adaptation and adoption of this curriculum. This project is a logical extension of the Alliance's vision and builds upon established relationships between industry, business, government, and education.

Award No. 9950072

Pennsylvania College of Technology

**Plastics Resources for Educators Program
(PREP)**

Award: \$805,326
(FY1999 \$258,323; FY2000 \$301,553; FY2001 \$245,450)

Plastics Technology

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The Plastics Resources for Educators Program (PREP) is establishing the educational infrastructure necessary to ensure that the nation's plastics industry remains internationally competitive. Today, plastics manufacturing represents the nation's fourth largest and fastest-growing industry, with a projected need for an additional 250,000 technicians and engineers by the year 2005. PREP is a collaboration between two primary institutions: the Pennsylvania College of Technology and Pennsylvania State University. Three other institutions also provide input. The project has three main objectives: (1) the development and maintenance of the "PREP Bookshelf," a warehouse of instructional materials for use in plastics technology education; (2) the development of a National Plastics Forum and a community of faculty; and (3) better pre-college outreach through collaboration with project partners.

Award No. 9950073

University of North Carolina at Chapel Hill

**North Carolina Consortium for Logistics Education
(NCCLE)**

Award: \$399,969
(FY1999 \$249,749; FY2000 \$150,220)

Logistics

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This project establishes the North Carolina Consortium for Logistics Education (NCCLE) for the purpose of developing a curriculum in global logistics to be administered through the North Carolina Logistics Education Training Center at the North Carolina Global TransPark. The North Carolina Global TransPark is an innovative new complex that enables "just in time" global operations by integrating multiple modes of transportation, information systems, and the knowledge and commercial support necessary to manage the increasingly complex flow of goods and information on a global basis.

The project's objectives focus on curriculum development, faculty development, recruitment and retention of traditionally underrepresented groups, and the integration of technology in education. The NCCLE curriculum will be modular, will be deliverable via a wide range of media, and will lead seamlessly to both two-year and four-year degrees in global logistics. This curriculum will broaden technical education in logistics across the state in response to the emerging demands of competitive business strategies based on speed in product manufacture and delivery.

Award No. 9950076

Traverse Bay Area Intermediate School District

The Power of Partnerships: Integrating Academics into the Manufacturing World

Award: \$725,292
(FY1999 \$269,213; FY2000 \$228,837; FY2001 \$227,242)

Manufacturing

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This project seeks to transform a successful, ongoing regional Manufacturing Technology Academy into a flexible and adaptable technological academy model. The idea is to lift students from the traditional high school or technical center setting into a more meaningful educational environment that delivers high-level academic content while emulating a corporate culture of quality. Although the academy currently focuses on manufacturing, almost any industry can serve as the skeleton for this model.

The technological academy model differs from the mainstream of both technology centers and traditional high schools in four key aspects: (1) a rigorous academic curriculum that integrates high-level secondary content like calculus, chemistry, economics, and physics into a workplace focus; (2) a uniquely successful manufacturing council partnership, which ensures constant communication and in-depth collaboration between teachers, manufacturing personnel, and students; (3) an innovative blend of the classroom and the workplace, which extends the classroom beyond its walls and brings an entrepreneurial spirit and corporate culture to its students and curriculum; and (4) marketing, recruitment, evaluation, and replication strategies aimed at continuously improving effectiveness and opening the technological academy's door to a larger and more diverse pool of students.

Award No. 9950078
Tunxis Community-Technical College
Statewide College of Technology
ATE Enhancement Project

Award: \$100,000
Engineering Technology

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The College of Technology, a consortium of engineering technology and technology studies curricula of the community and technical colleges in Connecticut, is planning to develop and implement an Introduction to Engineering course for the system colleges, as well as a high school engineering course. The consortium is building upon best practices in ATE projects and other programs in technological education. Consortium teams meet with representatives from industry, four-year colleges, and high schools to determine industry's needs and to develop an evaluation of competencies. Faculty are participating in industrial experiences and learning new pedagogical strategies valued by industry and academic institutions.

Award No. 9950080
Jefferson State Community College
Development of Job-Based Problems for
Technical Physics

Award: \$52,064
Physics

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Center Point, AL 35215-3098

Job-based problems similar to those technology students are likely to encounter when they begin work in industrial settings are not widely available for technical physics courses. Consequently, students frequently fail to see the relevance of physics to their studies and may not recognize physics-based applications when they encounter them on the job.

The objective of this project is to develop 40 job-based problem sets for technical physics. Physics and technology instructors, representatives from the Metropolitan Manufacturing Technology Center, and employees from small industries in the Birmingham area are collaborating to develop these problem sets. Instructors are visiting a variety of light and heavy manufacturing settings to research the foundations for problems covering the areas of motion, force, torque, and electricity. Instructors from Jefferson State Community Col-

lege and at least three other colleges will field-test the problems before they are distributed to other technical physics teachers at national and regional meetings and via the Web and CD-ROM.

Award No. 9950084
Bergen Community College

**Interdisciplinary Laboratory Science
Technology Program**

Award: \$184,952
Multidisciplinary

Pascal J. Ricatto *pjricatto@mailhost.bergen.cc.nj.us*
Bergen Community College (201) 447-7906
Dept. of Chemistry
400 Paramus Rd.
Paramus, NJ 07652-1508

Bergen Community College and Passaic County Community College are collaborating with four-year colleges and industry representatives to meet the growing demand for interdisciplinary science technologists who can use a variety of analytical instruments and deal with the new employment realities of rapidly changing assignments, variable functions, and multicultural teams. Through a new, broad-based, interdisciplinary A.A.S. curriculum, the project is (1) preparing students to effectively use a variety of modern laboratory equipment and analytical methods required by business and industry employers; (2) helping students gain interactive, classroom-based, experiential learning about work; (3) creating interactive, interdisciplinary learning modules that simulate workplace problems, activities, and assignments; (4) integrating laboratory internships, work-based learning experiences, and mentoring relationships; and (5) arranging peer support groups and an array of academic supportive services to ensure the retention, completion, and employment or further education of students, especially underrepresented populations.

Award No. 9950085
Jones County Junior College

**Southeast Consortium for Advanced Network
Technology Education**

Award: \$1,758,163
(FY1999 \$499,999; FY2000 \$677,304; FY2001 \$580,860)

Information Technology

Catherine P. Cotten *catherine.cotten@jcc.ms.us*
Jones County Junior College (601) 477-4115
Dept. of Information and Research
900 S. Court St.
Ellisville, MS 39437

This project focuses on existing and emerging network technologies beneficial to secondary schools, two-year colleges, and four-year colleges and universities. The particular technologies that the project targets are client/server, Internet/intranet, and multimedia utilizing computer networks.

The project has the following goals and objectives: (1) to identify and evaluate emerging network technology trends, applications, innovations, and curricula; (2) to disseminate these trends, applications, innovations, and curricula to educators and their students; (3) to compile career education information and develop strategies to promote interest by secondary and postsecondary students in careers in computer network technology and in the mathematics and science necessary for success in those careers; (4) to increase the enrollment of women and minorities in degree programs that lead to careers in network technology; (5) to support the continued educational competence of secondary and postsecondary faculty and administrators who teach, implement, or administer curricula in emerging network technologies; (6) to establish an infrastructure for providing internships and work-based learning opportunities in emerging network technologies for faculty and students; and (7) to build a network of education, government, and business entities that will support the development of quality programs to educate the future information technology workforce and to re-educate the present one.

Award No. 9950088

Rock Valley College

**Development and Field Test of a
Multimedia Simulation System for Training
Aviation Technicians via the Internet**

Award: \$499,918
(FY1999 \$249,958; FY2000 \$249,960)

Aviation Maintenance

Charles L. Billman *faav1cb@rvcux1.rvc.cc.il.us*
Rock Valley College (815) 397-4275
Dept. of Vocational Programs
3301 N. Muldford Rd.
Rockford, IL 61114

A coalition composed of a two-year college, a four-year university, a high school, professional associations, and the software and aviation maintenance industries is carrying out this project to develop, field-test, and disseminate a multimedia simulation system via the Internet for training aviation maintenance technicians. The project is enhancing the comprehension of the interdisciplinary nature of aviation maintenance technology (AMT) by students, including women and minorities; reducing training costs by maximizing the adaptability of the curriculum; and improving laboratory safety with minimized environmental hazards.

In particular, the project is (1) developing five simulation modules, each targeting a particular aspect of AMT in two-year associate degree programs; (2) field-testing the AMT simulation system in two-year college aviation maintenance classes; (3) introducing the simulation system and the technology behind it to AMT faculty at two-year colleges nationwide through workshops; and (4) disseminating the simulation system via both the Internet and CD-ROM to two-year college AMT faculty and high school counselors.

Award No. 9950098

Bellevue Community College

**Cyber Careers for the Net-Generation:
An Information Technology Career Education Video**

Award: \$40,000

Information Technology

Peter Saflund *psaflund@bcc.ctc.edu*
Bellevue Community College (425) 373-4216
NorthWest Center for Emerging Technologies
3000 Landerholm Cir., SE, N258
Bellevue, WA 98007-6484

The NorthWest Center for Emerging Technologies at Bellevue Community College and the Institute of Electrical and Electronics Engineers are collaborating to develop a video on information technology (IT) careers. This *Cyber Careers* video will target middle and high school students and non-IT

majors in college, and will include a special focus on women and minorities who have traditionally been underrepresented in IT. To attract students to the IT profession, the video will emphasize the profession's appeal in the view of younger students and will project a positive image of the IT worker.

Award No. 9950099

Moorpark College

**Industrial Biotechnology Instruction:
A Modular Approach**

Award: \$339,538

Biotechnology

Maureen T. Harrigan *harrigan@moorpark.cc.ca.us*
Moorpark College (805) 378-1400
Dept. of Biology
7075 Campus Rd.
Moorpark, CA 93021-1600

A community college and universities have partnered with industry to develop a model curriculum in biomanufacturing, focusing on eight modules designed after the departments of a manufacturing facility. Using this recently developed curriculum, the project is undertaking five main activities: (1) Students are being trained in biomanufacturing technologies with an option to obtain a Certificate of Achievement or an A.S. degree in biotechnology. (2) An instructional manufacturing laboratory that mimics the industrial environment is being set up, and scientists from industry are teaching the modules, guaranteeing that the technical training of students directly matches industry's needs. (3) A training manual based on the biomanufacturing modules is being developed for dissemination nationwide. (4) Workshops and other resources are being offered to assist faculty at other educational institutions who wish to adapt the prototype biomanufacturing curriculum. (5) Articulation arrangements are being established with secondary schools and universities to delineate a career path in biotechnology and ensure the academic preparedness of students.

Award No. 9950101

Wake Technical Community College

**A Resource Package for Integrating
Mathematics and Algebra-Based Physics**

Award: \$231,043

Mathematics and Physics

Robert L. Kimball *rlkimbal@mail.wake.tec.nc.us*
Wake Technical Community College (919) 662-3602
Dept. of Mathematics and Physics
9101 Fayetteville Rd.
Raleigh, NC 27603

This project aims (1) to construct a set of integrated activities to supplement mathematics and physics courses in engineering technology programs in two-year colleges, as well as high school courses; (2) to help students develop a positive attitude toward mathematics and physics; and (3) to better prepare students for a highly technical workplace.

Using the national skill standards, the American Mathematical Association of Two-Year Colleges' *Crossroads in Mathematics* document, and research from the American Association of Physics Teachers, mathematics and physics faculty are developing a resource package of integrated mathematics and physics activities. These activities cover the content found in algebra, trigonometry, calculus, and algebra-based physics courses and are designed to produce a student-centered learning environment in which students use technology routinely, participate in hands-on experiences regularly, and acquire the skills necessary to immediately apply mathematics in a variety of contexts. Participating students are being surveyed and tracked to evaluate the effect of the curriculum.

Award No. 9950105

Greenfield Community College

**Increasing the Flow: A Community College-Centered
Model to Meet Rural Information Technology Needs**

Award: \$420,000

Information Technology

Douglas H. Wilkins *wilkins@gcc.mass.edu*
Greenfield Community College (413) 775-1480
Division of Mathematics, Science, Business,
and Information Technology
One College Dr.
Greenfield, MA 01301

This project is increasing access for a diverse, rural population to two- and four-year postsecondary programs in information technology (IT). It is building upon existing relationships between educational institutions to create a persistent academic stream from high school to community college to baccalaureate institutions or IT employment. Curricula are being coordinated and courses are being shared via the Internet and

distance video platforms. Formal articulation agreements are being drafted and implemented.

The project focuses on developing educational practices and processes suited to areas without large employers. The project models how small colleges, many with a strong liberal arts tradition, can develop ongoing processes to engage small businesses throughout their service area to strengthen the regional IT infrastructure. Rural businesses and industry are full partners in this process, informing curriculum development and providing co-op work experiences for students and internships for high school and college faculty.

Award No. 9950106

Valencia Community College

Tech-4 Electronic Workforce Development System

Award: \$1,100,000

(FY1999 \$400,000; FY2000 \$400,000; FY2001 \$300,000)

Microelectronics

Cap Jadonath *cjadonath@gwmail.valencia.cc.fl.us*
Valencia Community College (407) 299-5000
Division of Business, Computer Technology,
Engineering, and Public Service
P.O. Box 3028
Orlando, FL 32802

Community colleges and universities along the "I-4 Corridor" (Tampa-Orlando-Daytona) in Central Florida are working with industry to offer programs in the engineering technology and electronics fields. As part of the Tech-4 High-Technology Industrial Education Consortium, this project is enhancing individualized institutional efforts to design an "electronics workforce development system" that maximizes learning for secondary school students and lower-division undergraduates through the sharing of industrial and educational resources. Eight modules focusing on different aspects of the electronics industry are located at facilities spread across the region. These serve as collaborative resource centers. Using the Maricopa Advanced Technology Education Center (MATEC) as a model, project partners are developing and modifying courses and activities. This collaboration between educators and industry representatives is building students' awareness of careers in electronics and engineering technology and is leading to increased enrollment, retention, completion, and placement rates. Instructors in secondary schools and community colleges are, through professional development, improving their understanding of industry's current needs.

Award No. 9970881

Concord Consortium

Hands on Physics: Evaluation and Dissemination

Award: \$128,070

Physics

Robert F. Tinker
Concord Consortium
37 Thoreau St.
Concord, MA 01742

bob@concord.org
(978) 371-3476

This project supports the summative evaluation and wide-spread dissemination of “Hands on Physics” (HOP), an innovative, inquiry-based approach to physics designed for high school and college students.

Because HOP represents a radically different way to teach physics, educators are demanding more evidence that it is effective and can achieve its goals. The limited studies undertaken so far have been formative, intended to help guide the materials development process. This project carries out a definitive summative study involving 10 sites.

HOP is adapted to delivery over the Web. This project is creating a complete implementation package of seven HOP units and supporting materials that can be widely disseminated and take full advantage of the Web. By creating a Web-based HOP interest group, the project is providing assistance in meeting teaching standards, selecting companion materials, performing student evaluation, and solving technical problems.

PROJECTS MANAGED BY OTHER NSF PROGRAMS AND CO-FUNDED BY ATE New Awards (1999)

In 1999 the ATE program contributed funds to several proposals that were submitted to and funded through other programs. Below, the ATE contribution is listed in parentheses after the estimated total award.

Award No. 9900698

Western Michigan University

Assessing the Impact and Effectiveness of the Advanced Technological Education (ATE) Program

Award: \$1,289,690 (ATE: \$646,014)

Evaluation

Arlen R. Gullickson
Western Michigan University
Evaluation Center
414 E. Clark St.
401B Ellsworth Hall
Kalamazoo, MI 49008

arlen.gullickson@wmich.edu
(616) 387-5895

This award is managed by the Evaluation Program in the Division of Research, Evaluation, and Communication.

NSF-funded projects are increasingly recognizing that performance accountability is a critical practice. However, few Principal Investigators (PIs) or their staff have the requisite expertise to develop and implement an accountability system. This project supports the development of tools for ATE projects to carry out accountability assessments using a common outcomes framework. In concert with ATE PIs, project personnel are preparing a set of indicators that represent quality technical education, preparing and pilot-testing instruments and guidebooks for data collection, and collecting data from ATE projects that will provide information on the impact and effectiveness of the ATE program.

Award No. 9909552

Pikes Peak Community College

A National Model for Curriculum Adaptation and Implementation

Award: \$45,633 (ATE: \$20,000)

Information Technology

Comfort F. Cover
Pikes Peak Community College
Dept. of Learning Technologies
5675 S. Academy Blvd.
Colorado Springs, CO 80906

cover@ppcc.cccoes.edu
(719) 540-7397

This award is managed by the Course, Curriculum, and Laboratory Improvement (CCLI) program in the Division of Undergraduate Education.

This project aims to develop and validate a national model for the adaptation and implementation of an advanced technology curriculum by using satellite teleconferencing and Internet resources. The model begins with a national teleconference featuring a panel discussion and multimedia presentation of a new associate degree curriculum in computer networking. A series of follow-up activities then provide the necessary resources for two-year college faculty and administrators to adapt and implement the curriculum. The curriculum is a component of the Association for Computing Machinery (ACM) Guidelines for Degree and Certificate Programs to Support Computing in a Networked Environment, produced by ACM's Two-Year College Education Committee.

Project activities include (1) identifying a variety of resources to support adaptation and implementation of associate degree and certificate programs in networking; (2) identifying 20 institutions across the United States as primary sites to implement the new curriculum; (3) disseminating information and strategies for adapting and implementing the new curriculum; (4) establishing a uniform protocol to evaluate the model at the 20 primary sites; (5) establishing a discussion forum for the participants; and (6) providing ongoing assistance, mentoring, and peer support to facilitate the adaptation and implementation process.

Award No. 9950381

Linn State Technical College

**College Mathematics From an Industry-Based
Multidisciplinary Technological Perspective**

Award: \$75,000 (ATE: \$20,000)

Mathematics

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One Technology Drive
Linn, MO 65051

velie@linnstate.edu
(573) 897-3603

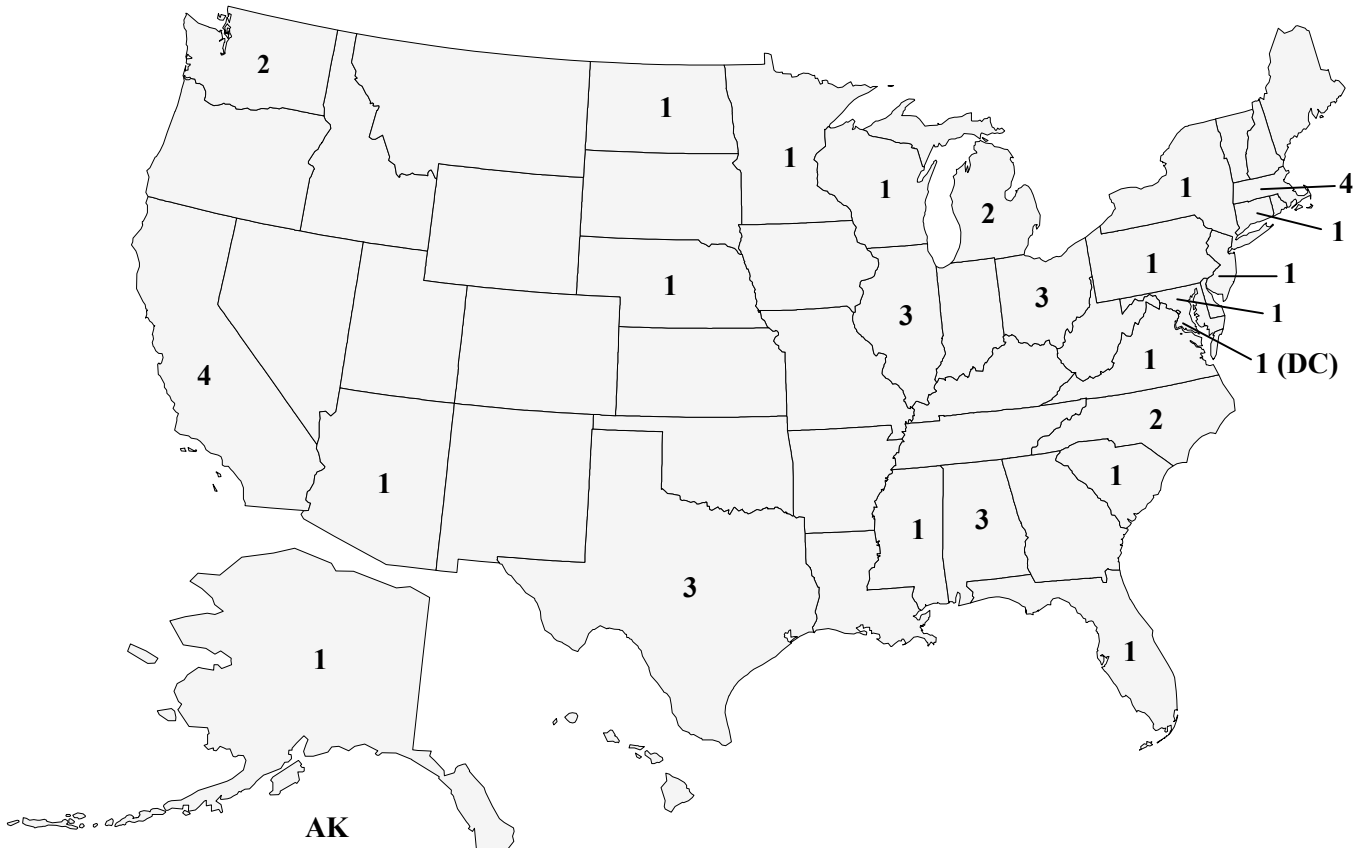
This award is managed by the Course, Curriculum, and Laboratory Improvement (CCLI) program in the Division of Undergraduate Education.

This project is developing and evaluating two mathematics modules, from a projected suite of seven, based on using current, meaningful industry-based problems or case studies. When complete, the seven modules will be usable either individually or as a full college-level mathematics course, "Industry-Based College Mathematics," which will cover most of college algebra and will develop an effective set of problem-solving heuristics. This project includes testing and evaluating the two prototype modules at Linn State Technical College, Southeast Missouri State University, and Oklahoma State University at Okmulgee. If the evaluation confirms the value of this approach, this project is expected to lead to the development of the complete suite of seven modules.

DISTRIBUTION OF NEW ATE AWARDS BY STATE FY1999

(excluding ATE-supported awards managed by other programs)

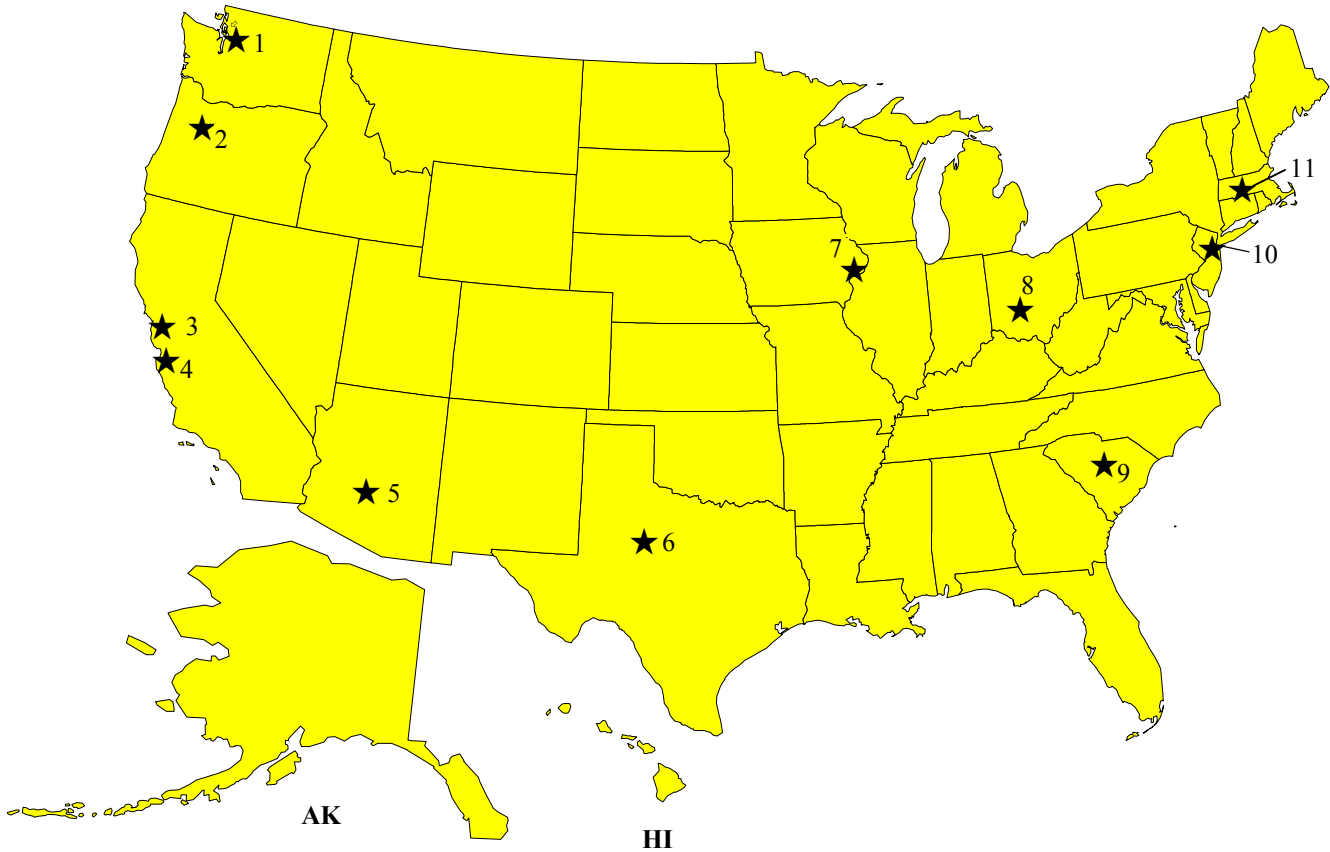
*119 proposals received
42 awards made: 2 centers, 40 projects*



State	Institution	City
AK	Ilisagvik College	Barrow
AL	Jefferson State CC	Birmingham
AL	Gadsden State CC (2)	Gadsden
AZ	Maricopa County CC District	Tempe
CA	Moorpark College	Moorpark
CA	Peralta CC District Office	Oakland
CA	Partnership for Environmental Tech. Ed.	Pleasanton
CA	Cuesta College	San Luis Obispo
CT	Tunxis Community-Technical College	Farmington
DC	American Assn. of Community Colleges	Washington
FL	Valencia CC	Orlando
IL	Joliet Junior College	Joliet
IL	Moraine Valley CC	Palos Hills
IL	Rock Valley College	Rockford
MA	Concord Consortium	Concord
MA	Greenfield CC	Greenfield
MA	Consortium for Math. & Its Applications	Lexington
MA	Berkshire CC	Pittsfield
MD	Essex CC	Essex
MI	Mott CC	Flint

State	Institution	City
MI	Traverse Bay Area Intermediate School Dist.	Traverse City
MN	Global Wireless Education Consortium	Mankato
MS	Jones County Junior College	Ellisville
NC	University of N.C. at Chapel Hill	Chapel Hill
NC	Wake Tech. CC	Raleigh
ND	Bismarck State College	Bismarck
NE	Southeast CC	Lincoln
NJ	Bergen CC	Paramus
NY	SUNY Onondaga CC	Syracuse
OH	University of Cincinnati	Cincinnati
OH	Sinclair CC	Dayton
OH	Miami University Middletown	Middletown
PA	Pennsylvania College of Technology	Williamsport
SC	S.C. Board for Tech. & Comprehensive Ed.	Columbia
TX	Texas Engineering Experiment Station	College Station
TX	Collin County CC	McKinney
TX	College of the Mainland	Texas City
VA	J. Sargent Reynolds CC	Richmond
WA	Bellevue CC (2)	Bellevue
WI	Milwaukee Area Tech. College	Milwaukee

ATE CENTERS OF EXCELLENCE



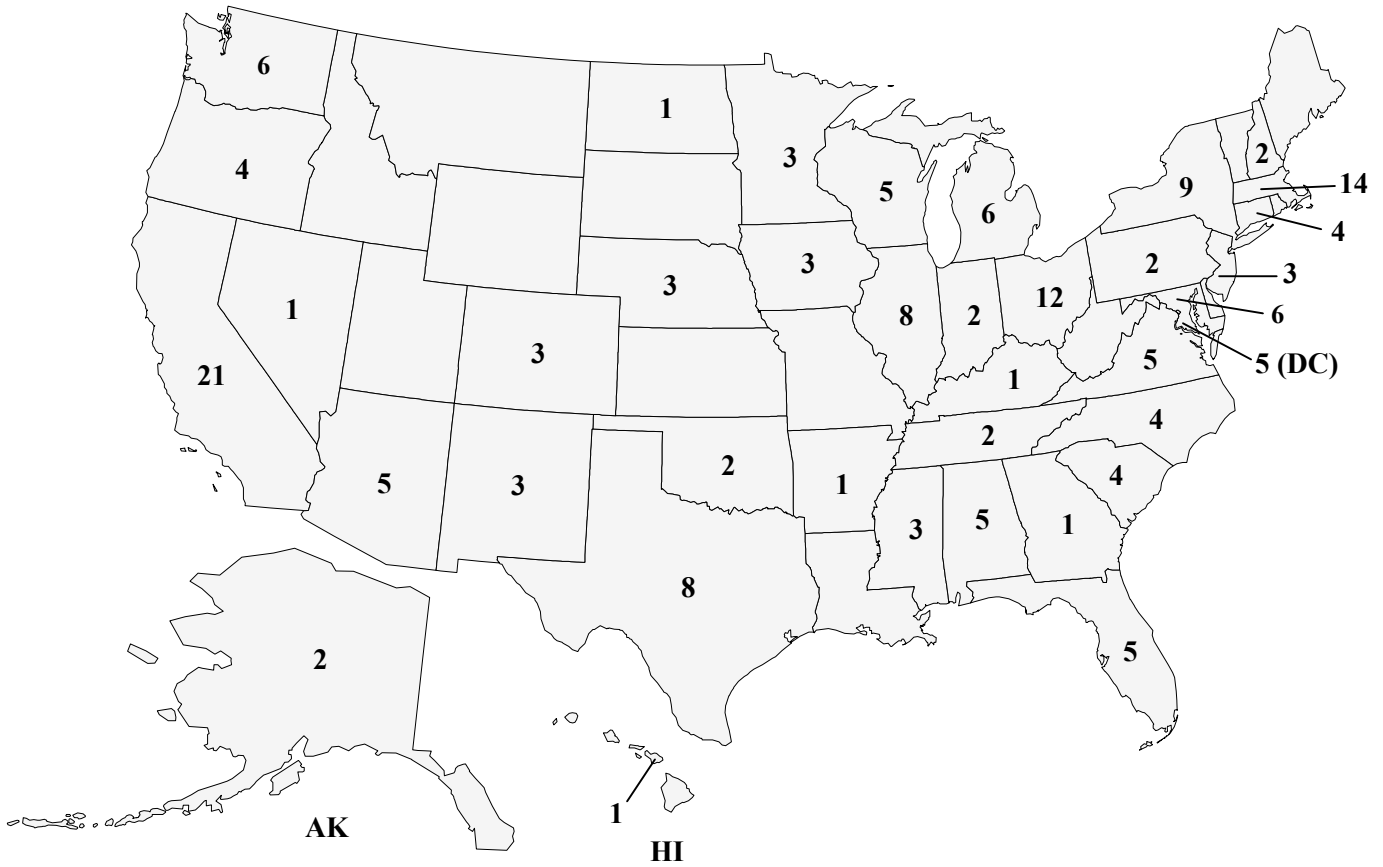
1. NorthWest Center for Emerging Technologies (Bellevue, WA)
2. Northwest Center for Sustainable Resources (Salem, OR)
3. Bio-Link: A National Advanced Technological Education Center for Biotechnology (San Francisco, CA)
4. Marine Advanced Technology Education Center (Monterey, CA)
5. Maricopa Advanced Technology Education Center (Tempe, AZ)
6. Southwest Center for Advanced Technological Education (Sweetwater, TX)
7. Advanced Technology Environmental Education Center (Bettendorf, IA)
8. National Center of Excellence for Advanced Manufacturing Education (Dayton, OH)
9. South Carolina Advanced Technological Education Center (Columbia, SC)
10. New Jersey Center for Advanced Technological Education (Edison, NJ)
11. Northeast Center for Telecommunications Technologies (Springfield, MA)

http://www.ehr.nsf.gov/EHR/DUE/awards/ate_centers.asp

DISTRIBUTION OF ACTIVE AND NEW ATE AWARDS BY STATE FY1999

(excluding ATE-supported awards managed by other programs)

Total number of awards: 175



ACTIVE AND NEW ATE AWARDS

FY1999

(excluding ATE-supported awards managed by other programs)

The following list includes new awards made during FY1999, as well as awards made during previous years but still active during FY1999. The list includes only awards managed by the ATE program, not awards which are managed by other programs but which also received a contribution from the ATE program. Award data have been compiled from the NSF main database.

The awards are arranged by the field of technology or science that is their primary focus; however, many projects embrace multiple fields or focus on general education in mathematics or science. ATE centers are denoted by an asterisk (*). The "Abstract Location" column gives the NSF publication number of the *Awards and Activities* book in which an award's abstract can be found.

Abstracts and other award data are also available through NSF's World Wide Web site <<http://www.nsf.gov>> and the Division of Undergraduate Education's Web-based Project Information Resource System <<http://www.ehr.nsf.gov/PIRSWeb/Search/>>.

FIELD OF TECHNOLOGY Institution	State	PI	Award No.	\$ Total	Effective Date	Expiration Date	Abstract Location
AGRICULTURE							
Hawkeye CC	IA	Brase	9752081	700,000	08/01/97	07/31/00	NSF 97-50, p. 51
U. of New Hampshire	NH	Giles	9752053	74,954	07/01/97	12/31/98	NSF 98-110, p. 15
AQUACULTURE							
Gadsden State CC	AL	Simpson	9950063	47,682	06/01/99	05/31/00	This book, p. 18
New England Board of Higher Ed.	MA	Stewart	9752050	449,975	07/01/97	06/30/00	NSF 98-110, p. 15
AVIATION TECHNOLOGY							
Rock Valley Coll.	IL	Billman	9950088	499,918	06/15/99	05/31/01	This book, p. 22
BIOTECHNOLOGY							
Catonsville CC	MD	Jones	9850289	499,897	06/01/98	05/31/01	NSF 99-113, p. 11
City Coll. of San Francisco*	CA	Johnson	9850325	2,999,995	09/01/98	08/31/01	NSF 99-113, p. 6
Cold Spring Harbor Lab.	NY	Micklos	9752037	599,825	08/01/97	07/31/00	NSF 98-110, p. 14
De Anza Coll.	CA	Schroeder	9553708	225,305	09/01/95	02/29/00	NSF 97-50, p. 49
East Los Angeles Coll.	CA	Chan	9850341	305,000	07/15/98	12/31/99	NSF 99-113, p. 18
Ed. Development Ctr.	MA	Leff	9752051	472,158	09/01/97	02/29/00	NSF 98-110, p. 15
Foothill Coll.	CA	Carter	9752090	599,983	09/01/97	08/31/00	NSF 98-110, p. 20
J. Sargent Reynolds CC	VA	Flowers	9950053	71,873	07/01/99	06/30/00	This book, p. 16
Madison Area Tech. Coll.	WI	McMillan	9752027	360,000	10/01/97	09/30/99	NSF 98-110, p. 13
Middlesex CC	MA	Werner	9454642	1,132,394	01/01/95	06/30/99	NSF 97-50, p. 58
Moorpark Coll.	CA	Harrigan	9950099	339,538	08/01/99	07/31/01	This book, p. 22
Nat'l Assn. of Biology Teachers	VA	Frame	9553720	499,239	10/01/95	09/30/00	NSF 97-50, p. 50
Peralta CC District Office	CA	Long	9950057	749,998	07/01/99	06/30/02	This book, p. 17
Rutgers U. Cook Coll.	NJ	Ward	9602356	350,000	07/15/96	06/30/99	NSF 97-50, p. 29
CHEMICAL TECHNOLOGY							
Alabama Southern CC	AL	Prout	9850258	870,000	06/01/98	05/31/01	NSF 99-113, p. 8
Athens Area Tech. Inst.	GA	White	9850247	733,372	06/15/98	05/31/00	NSF 99-113, p. 7
Coll. of the Mainland	TX	Kile	9950071	898,493	09/01/99	08/31/02	This book, p. 19
Edmonds CC	WA	O'Brien	9602403	440,137	08/01/96	12/31/01	NSF 97-50, p. 36
Harry S. Truman Coll.	IL	Soucek	9602443	210,081	09/01/96	08/31/99	NSF 97-50, p. 39
Miami U. Middletown	OH	Sarquis	9751993	825,720	10/01/97	09/30/99	NSF 98-110, p. 9
Miami U. Middletown	OH	Sarquis	9950011	800,000	10/01/99	09/30/02	This book, p. 11
Michigan Technological U.	MI	Fisher	9553671	499,996	09/01/95	02/29/00	NSF 97-50, p. 44

FIELD OF TECHNOLOGY Institution	State	PI	Award No.	\$ Total	Effective Date	Expiration Date	Abstract Location
CHEMICAL TECHNOLOGY (<i>continued</i>)							
Southeast CC	NE	Kenkel	9553674	191,590	01/01/96	12/31/98	NSF 97-50, p. 44
Southeast CC	NE	Kenkel	9751998	398,479	07/15/97	06/30/99	NSF 98-110, p. 10
Southeast CC	NE	Kenkel	9950042	375,000	10/01/99	09/30/01	This book, p. 14
U. of Cincinnati	OH	Kryman	9602437	1,098,276	09/01/96	08/31/99	NSF 97-50, p. 38
DISTANCE LEARNING							
Daytona Beach CC	FL	Williams	9752054	551,106	09/01/97	08/31/00	NSF 98-110, p. 16
Texas State Tech. Coll., Sweetwater*	TX	Wright	9714435	1,253,697	10/01/97	09/30/00	NSF 98-110, p. 7
U. of Hawaii Maui CC	HI	Converse	9850343	137,893	10/01/98	09/30/99	NSF 99-113, p. 18
ELECTRONICS, INSTRUMENTATION, LASER AND FIBER OPTICS							
Broward CC	FL	Sanders	9602383	250,000	08/01/96	07/31/99	NSF 97-50, p. 33
CUNY Queensborough CC	NY	Lieberman	9752061	600,000	09/01/97	08/31/00	NSF 98-110, p. 17
Ed. Development Ctr.	MA	Aring	9850299	274,667	10/01/98	09/30/00	NSF 99-113, p. 11
Front Range CC	CO	Braun	9553685	301,783	09/01/95	08/31/99	NSF 97-50, p. 45
U. of Connecticut	CT	Roychoudhuri	9752092	267,000	10/01/97	09/30/99	NSF 98-110, p. 20
Western Wisconsin Tech. Coll.	WI	Skewes	9850287	420,000	07/01/98	06/30/00	NSF 99-113, p. 10
ENERGY TECHNOLOGY							
Bismarck State Coll.	ND	DeHart	9950034	611,969	09/01/99	08/31/02	This book, p. 13
ENGINEERING TECHNOLOGY (GENERAL)							
Cuesta Coll.	CA	Akelian	9850283	82,444	07/01/98	06/30/99	NSF 99-113, p. 10
Cuesta Coll.	CA	Akelian	9950015	494,916	07/01/99	06/30/02	This book, p. 11
Middlesex County Coll.*	NJ	Waintraub	9553749	2,966,472	09/01/95	08/31/00	NSF 97-50, p. 23
Middlesex County Coll.*	NJ	Waintraub	9813444	2,000,001	09/01/98	08/31/01	NSF 99-113, p. 5
New Mexico State U.	NM	Smolleck	9602430	169,177	08/15/96	01/31/99	NSF 97-50, p. 37
S.C. Bd. for Tech. & Comprehensive Ed.*	SC	Craft	9602440	2,100,000	09/01/96	08/31/00	NSF 97-50, p. 21
S.C. Bd. for Tech. & Comprehensive Ed.*	SC	Craft	9908409	2,000,000	09/01/99	08/31/02	This book, p. 9
Tunxis Community-Tech. Coll.	CT	Wosczyzna-Birch	9950078	100,000	08/15/99	01/31/01	This book, p. 20
ENVIRONMENTAL TECHNOLOGY							
Cape Cod CC	MA	Curran	9850318	232,179	06/01/98	05/31/01	NSF 99-113, p. 15
Chemeketa CC*	OR	Cudmore	9553760	2,998,443	10/01/95	09/30/99	NSF 97-50, p. 24
Chemeketa CC*	OR	Cudmore	9813445	1,996,949	10/01/98	09/30/01	NSF 99-113, p. 5
CUNY Bronx CC	NY	Fahey	9850304	700,000	07/01/98	06/30/01	NSF 99-113, p. 12
Hazardous Materials Training & Res. Ctr.*	IA	Kabat Lensch	9714425	2,000,000	09/15/97	08/31/01	NSF 98-110, p. 6
Intelcom Intelligent Telecommunications	CA	Beaty	9454521	1,499,966	09/01/94	08/31/99	NSF 97-50, p. 55
Intelcom Intelligent Telecommunications	CA	Beaty	9751988	986,000	09/01/97	08/31/00	NSF 98-110, p. 9
Mesa State Coll.	CO	Topper	9454633	399,778	10/01/94	09/30/99	NSF 97-50, p. 57
Mount Hood CC	OR	Jackman	9751983	169,158	07/15/97	06/30/00	NSF 98-110, p. 8
Northwest Indian Coll.	WA	Burns	9752076	775,049	09/01/97	08/31/00	NSF 98-110, p. 18
Partnership for Environmental Tech. Ed.	CA	Dickinson	9602365	600,000	10/01/96	03/31/99	NSF 97-50, p. 31
Partnership for Environmental Tech. Ed.	CA	Dickinson	9950051	600,328	05/01/99	04/30/01	This book, p. 15
Pima County CC	AZ	Ogden	9602368	330,000	10/01/96	09/30/99	NSF 97-50, p. 31
Stark Tech. Coll.	OH	Cramer	9553768	516,219	09/01/95	08/31/99	NSF 97-50, p. 53
U. of Alaska Southeast, Sitka	AK	Carnegie	9553680	600,000	10/01/95	12/31/99	NSF 97-50, p. 45
U. of Minnesota, Duluth	MN	Munson	9752017	656,576	07/01/97	06/30/00	NSF 98-110, p. 11
U. of Nevada Desert Research Inst.	NV	Wetzel	9602351	450,000	10/01/96	09/30/99	NSF 97-50, p. 28

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GENERAL or MULTIDISCIPLINARY							
Amarillo Coll.	TX	Jones	9850355	200,000	09/15/98	08/31/00	NSF 99-113, p. 20
Amer. Assn. of Community Colleges	DC	Barnett	9713868	484,058	08/01/97	07/31/00	NSF 98-110, p. 23
Amer. Assn. of Community Colleges	DC	Barnett	9908191	974,949	06/01/99	05/31/02	This book, p. 10
Amer. Chemical Society	DC	Ware	9752102	735,650	09/01/97	08/31/00	NSF 98-110, p. 21
Austin CC	TX	Rodi	9553689	318,715	09/01/95	12/31/98	NSF 97-50, p. 46
Bay Shore Union Free School District	NY	Brachio	9850257	86,724	05/15/98	04/30/00	NSF 99-113, p. 8
Bergen CC	NJ	Ricatto	9950084	184,952	09/01/99	08/31/02	This book, p. 21
Berkshire CC	MA	Mulholland	9950067	300,000	10/01/99	09/30/01	This book, p. 18
Collin County CC	TX	Baltzer	9950025	847,785	07/01/99	06/30/02	This book, p. 12
Harvard Coll. Observatory	MA	Sadler	9602404	373,927	01/01/97	12/31/98	NSF 97-50, p. 36
Hillsboro School District 1J	OR	Barnekoff	9752025	205,224	10/01/97	09/30/00	NSF 98-110, p. 12
Hillsborough CC	FL	Falls	9850291	297,906	04/01/98	03/31/01	NSF 99-113, p. 11
Illinois State U.	IL	Meier	9752083	450,000	09/01/97	08/31/99	NSF 98-110, p. 19
Itasca CC	MN	Wenger	9752084	445,961	06/01/97	12/31/99	NSF 98-110, p. 19
Milwaukee Area Tech. Coll.	WI	Hodgkinson	9950046	1,095,684	06/01/99	05/31/02	This book, p. 15
Mission Coll.	CA	Behm	9602345	500,000	01/01/97	12/31/99	NSF 97-50, p. 27
MPR Associates	CA	Hoachlander	9752036	399,913	08/15/97	07/31/00	NSF 98-110, p. 14
Nashville State Tech. Inst.	TN	Rogers	9850307	1,629,004	10/01/98	09/30/01	NSF 99-113, p. 13
Nat'l Alliance of Business	DC	Joyce	9602352	399,972	09/01/96	08/31/99	NSF 97-50, p. 28
Ohio U.	OH	Kline	9850350	90,135	07/01/98	06/30/99	NSF 99-113, p. 19
Phi Theta Kappa Headquarters	MS	Risley	9811926	307,847	09/01/98	08/31/00	NSF 99-113, p. 21
Piedmont Tech. Coll.	SC	Mack	9553740	1,419,128	09/01/95	08/31/99	NSF 97-50, p. 51
Purdue U.	IN	Gentry	9602355	1,348,391	08/01/96	07/31/01	NSF 97-50, p. 29
Sinclair CC	OH	Anderson	9752015	100,000	08/01/97	07/31/99	NSF 98-110, p. 11
SUNY Onondaga CC	NY	Gaonkar	9950019	449,725	07/01/99	06/30/02	This book, p. 11
U. of Chicago	IL	Landsberg	9850273	574,699	07/01/98	06/30/01	NSF 99-113, p. 9
U. of Illinois, Chicago	IL	Jenkins	9850327	968,187	06/15/98	05/31/01	NSF 99-113, p. 17
Wytheville CC	VA	Tice	9602397	299,694	09/15/96	05/31/00	NSF 97-50, p. 35
GEOGRAPHIC INFORMATION SYSTEMS							
Cypress Coll.	CA	Doak	9850306	799,906	09/01/98	08/31/00	NSF 99-113, p. 12
Geological Society of America	CO	Devaul	9602408	614,684	10/01/96	09/30/00	NSF 97-50, p. 37
Henry Ford CC	MI	Waddell	9752086	1,200,000	09/01/97	08/31/00	NSF 98-110, p. 20
Houston CC	TX	Nye	9850344	394,318	06/01/98	05/31/01	NSF 99-113, p. 19
Prince George's CC	MD	Cunniff	9553662	694,941	09/01/95	08/31/99	NSF 97-50, p. 43
GRAPHICS and MULTIMEDIA TECHNOLOGY							
Ctr. for Image Processing in Ed.	AZ	Magisos	9752101	708,968	10/01/97	09/30/99	NSF 98-110, p. 21
CUNY Borough of Manhattan CC	NY	Cohen	9850309	550,000	07/01/98	06/30/01	NSF 99-113, p. 13
Essex CC	MD	Sorkin	9950056	272,000	04/01/99	03/31/02	This book, p. 16
John C. Calhoun State CC	AL	Mitchell	9752014	96,959	09/01/97	02/28/99	NSF 98-110, p. 11
Pasadena City Coll.	CA	Carter	9752096	380,000	09/01/97	08/31/00	NSF 98-110, p. 21
Piedmont Virginia CC	VA	Pittman	9752021	600,000	06/15/97	05/31/00	NSF 98-110, p. 12
INFORMATION TECHNOLOGY, TELECOMMUNICATIONS							
Bellevue CC*	WA	Evans	9553727	3,017,054	09/01/95	12/31/98	NSF 97-50, p. 23
Bellevue CC*	WA	Evans	9813446	1,999,941	09/01/98	08/31/01	NSF 99-113, p. 6
Bellevue CC	WA	Evans	9907986	300,000	06/15/99	05/31/02	This book, p. 10
Bellevue CC	WA	Saflund	9950098	40,000	02/01/99	01/31/00	This book, p. 22
CUNY Queensborough CC	NY	Mohr	9602369	639,625	09/15/96	08/31/00	NSF 97-50, p. 32
Diné Coll.	AZ	Coffey	9850353	819,994	07/01/98	06/30/01	NSF 99-113, p. 20
Evergreen Valley Coll.	CA	Estrada	9850337	375,000	06/15/98	11/30/99	NSF 99-113, p. 18

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Global Wireless Ed. Consortium	MN	Baker	9950039	248,616	06/15/99	05/31/02	This book, p. 14
Greenfield CC	MA	Wilkins	9950105	420,000	07/01/99	06/30/01	This book, p. 23
Ilisagvik Coll.	AK	Selmer	9950069	308,764	05/01/99	04/30/02	This book, p. 18
Jones County Junior Coll.	MS	Cotten	9752060	1,082,122	05/15/97	04/30/00	NSF 98-110, p. 16
Jones County Junior Coll.	MS	Cotten	9950085	1,758,163	06/01/99	05/31/02	This book, p. 21
Moraine Valley CC	IL	Sands	9950037	315,792	04/01/99	03/31/02	This book, p. 14
Nashville State Tech. Inst.	TN	Rogers	9602401	449,594	10/01/96	05/31/99	NSF 97-50, p. 35
San Jose State U.	CA	Ibrahim	9752004	199,944	07/15/97	12/31/99	NSF 98-110, p. 10
Sinclair CC	OH	Harrison	9950028	856,583	08/01/99	07/31/02	This book, p. 12
Springfield Tech. CC*	MA	Masi	9751990	3,000,000	09/01/97	08/31/00	NSF 98-110, p. 5
TERC	MA	Pulis	9850311	695,924	06/15/98	05/31/00	NSF 99-113, p. 14
U. of Cincinnati	OH	Saad	9950029	853,640	07/01/99	06/30/02	This book, p. 13
U. of Kentucky Lexington CC	KY	Crowley	9850313	849,995	07/01/98	06/30/01	NSF 99-113, p. 14
MACHINE TOOL TECHNOLOGY, METROLOGY							
Madison Area Tech. Coll.	WI	Anderegg	9752032	299,900	09/01/97	08/31/99	NSF 98-110, p. 13
San Diego City Coll.	CA	Stepsis	9996128	64,584	11/01/98	12/31/99	NSF 97-50, p. 50
MANUFACTURING and INDUSTRIAL TECHNOLOGY							
Cleveland State U.	OH	Schoenig	9602457	608,756	09/01/96	08/31/99	NSF 97-50, p. 40
Cleveland State U.	OH	Schoenig	9850288	206,026	09/01/98	02/29/00	NSF 99-113, p. 10
Edison Industrial Systems Ctr.	OH	Sully	9602431	1,200,000	09/01/96	12/31/99	NSF 97-50, p. 38
Gadsden State CC	AL	Baker	9950059	199,977	10/01/99	09/30/01	This book, p. 17
Henry Ford CC	MI	Martini	9850282	500,000	07/01/98	06/30/00	NSF 99-113, p. 9
Indiana U.-Purdue U. Indianapolis	IN	Cooney	9553699	297,475	10/01/95	12/31/99	NSF 97-50, p. 47
Iowa State U.	IA	Schmerr	9602370	673,705	10/01/96	09/30/99	NSF 97-50, p. 32
Johns Hopkins U.	MD	Packer	9850249	1,009,041	09/01/98	08/31/01	NSF 99-113, p. 8
Mott CC	MI	Crampton	9950052	500,738	08/01/99	07/31/01	This book, p. 15
Mount Wachusett CC	MA	Weidhaas	9850317	200,000	07/01/98	06/30/00	NSF 99-113, p. 14
N.C. State Board of Community Colleges	NC	Girardeau	9553709	139,450	10/01/95	09/30/99	NSF 97-50, p. 49
Norfolk State U.	VA	Jacobs	9751987	66,900	10/01/97	03/31/00	NSF 98-110, p. 9
Oklahoma State U., Okmulgee	OK	Allison	9602390	600,000	07/01/96	12/31/98	NSF 97-50, p. 35
Oklahoma State U., Okmulgee	OK	Allison	9850324	650,000	07/01/98	06/30/01	NSF 99-113, p. 16
Pennsylvania Coll. of Technology	PA	Weston	9950072	805,326	08/01/99	07/31/02	This book, p. 19
Pennsylvania State U.	PA	Weston	9751984	600,735	08/15/97	12/31/99	NSF 98-110, p. 8
Sinclair CC*	OH	Harrison	9714424	2,000,000	01/01/98	12/31/00	NSF 98-110, p. 6
Southern Illinois U., Carbondale	IL	Abrate	9850351	284,800	08/15/98	07/31/00	NSF 99-113, p. 19
Traverse Bay Area Intermediate Sch. Dist.	MI	Chambers	9950076	725,292	07/01/99	06/30/02	This book, p. 20
Trident Tech. Coll.	SC	Whipple	9752062	240,000	09/01/97	08/31/00	NSF 98-110, p. 17
U. of North Carolina, Chapel Hill	NC	Greis	9950073	399,969	06/01/99	05/31/01	This book, p. 19
U. of Washington	WA	Stoebe	9602360	221,174	01/01/97	12/31/00	NSF 97-50, p. 30
Waukesha County Tech. Coll.	WI	Timmer	9752082	700,000	08/01/97	07/31/00	NSF 98-110, p. 19
Wayne State U.	MI	Rathod	9752024	450,000	09/01/97	08/31/00	NSF 98-110, p. 12
Westark Coll.	AR	Connor	9850334	314,278	07/01/98	12/31/99	NSF 99-113, p. 17
MARINE TECHNOLOGY							
Consortium for Oceanographic Res. & Ed.	DC	Winokur	9814210	70,598	09/01/98	08/31/00	NSF 99-113, p. 21
Monterey Peninsula Coll.*	CA	Crane	9752028	3,086,970	09/15/97	02/28/01	NSF 98-110, p. 5
MATHEMATICS							
Capital Community Tech. Coll.	CT	Pazdar	9602456	259,914	09/01/96	08/31/99	NSF 97-50, p. 40
Capital Community Tech. Coll.	CT	Pazdar	9850244	125,000	04/01/98	03/31/00	NSF 99-113, p. 7

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COMAP	MA	Garfunkel	9950036	674,677	06/01/99	05/31/02	This book, p. 13
CUNY Bronx CC	NY	Forman	9713869	187,459	09/01/97	08/31/99	NSF 98-110, p. 24
Lane CC	OR	Shellabarger	9752058	262,800	10/01/97	09/30/00	NSF 98-110, p. 16
Maricopa County CC District	AZ	Jacobs	9602386	353,235	09/01/96	08/31/99	NSF 97-50, p. 34
SUNY Adirondack CC	NY	Patrick	9553765	234,194	09/01/95	08/31/99	NSF 97-50, p. 52
Wake Tech. CC	NC	Kimball	9752038	119,999	09/01/97	08/31/00	NSF 98-110, p. 14
Wake Tech. CC	NC	Kimball	9950101	231,043	05/01/99	04/30/01	This book, p. 23
Wentworth Inst. of Tech.	MA	Simundza	9553704	492,392	09/01/95	11/30/99	NSF 97-50, p. 48
MICROELECTRONICS, SEMICONDUCTOR MANUFACTURING							
Albuquerque Tech. Vocational Inst.	NM	Willis	9602349	421,318	10/01/96	09/30/99	NSF 97-50, p. 27
Maricopa County CC District*	AZ	de los Santos	9602373	2,713,446	09/01/96	08/31/99	NSF 97-50, p. 21
Maricopa County CC District*	AZ	Lesiecki	9908419	2,000,000	09/01/99	08/31/02	This book, p. 9
U. of New Mexico	NM	Wood	9850310	900,000	07/01/98	06/30/01	NSF 99-113, p. 13
Valencia CC	FL	Jadonath	9950106	1,100,000	10/01/99	09/30/02	This book, p. 23
PHYSICS							
Amer. Assn. of Physics Teachers	MD	Monroe	9450160	1,199,999	03/15/95	02/28/01	NSF 97-50, p. 62
Amer. Inst. of Physics	MD	Neuschatz	9453180	385,680	07/01/95	06/30/00	NSF 97-50, p. 61
Austin CC	TX	Rodi	9850319	144,947	01/01/99	12/31/00	NSF 99-113, p. 15
Concord Consortium	MA	Tinker	9970881	128,070	07/01/99	06/30/00	This book, p. 24
Jefferson State CC	AL	Yazdi	9950080	52,064	05/01/99	04/30/01	This book, p. 20
Joliet Junior Coll.	IL	Hieggelke	9950062	305,000	05/01/99	04/30/01	This book, p. 17
New Hampshire Tech. Coll., Berlin	NH	Davis	9850326	238,270	05/15/98	04/30/00	NSF 99-113, p. 16
Seminole CC	FL	Dickison	9553665	469,264	10/01/95	02/28/01	NSF 97-50, p. 44
Texas Engineering Experiment Station	TX	Clark	9950006	705,616	10/01/99	09/30/03	This book, p. 10
TRANSPORTATION							
Coll. of the Desert	CA	Pulliam	9602448	299,980	08/01/96	12/31/98	NSF 97-50, p. 39
York Tech. Coll.	SC	Kosak	9850269	500,000	10/01/98	09/30/01	NSF 99-113, p. 9

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