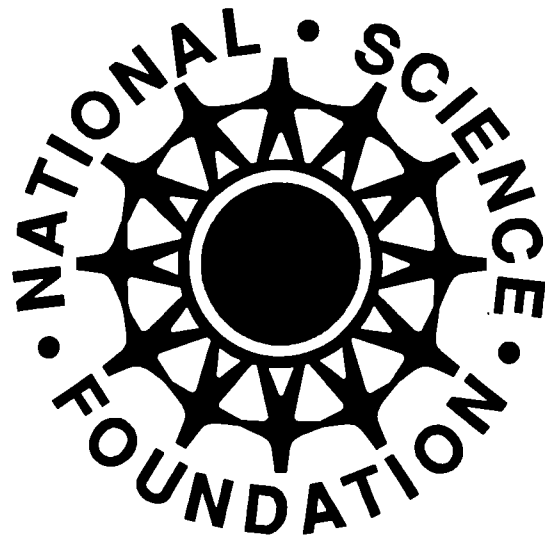


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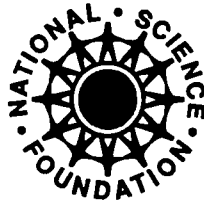
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FY 1995 Awards
and Continuations

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Division of Undergraduate Education

The Advanced Technological Education (ATE) Program

FY1995 Awards

Table of Contents

I. Introduction Information about the ATE program and FY1995 Awards	2
II. Abstracts of the Awarded Proposals	
Centers of Excellence (New Awards).....	15
Centers of Excellence (Continuing Awards).....	17
Projects (New Awards)	19
Projects (Continuing Awards)	36
Special Projects	48
Projects ATE Co-Funded	53
ILI FY 1995 Awards in 2 Year Colleges.....	61
III. Appendix	
Award Maps.	69
Index of Awards By State (New and Continuing Awards)	73
Index of Principle Investigators	88

DRAFT

ADVANCED TECHNOLOGICAL EDUCATION (ATE)

The ATE program promotes exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement at the undergraduate and secondary school levels, especially for technicians being educated for the high performance workplace of advanced technologies. *Curriculum development* encompasses the design and implementation of new curricula, courses, laboratories, and Institution materials. *Program improvement* encompasses faculty and teacher development, student academic support, and formal cooperative arrangements among institutions and other partners. ATE projects and Centers result in major improvements in advanced technological education, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-applicable educational products. All projects and Centers have a vision for technician education which is used to guide project development. The ATE program is managed jointly by the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE).

LEADERSHIP AND DEVELOPMENT ACTIVITIES

In its second year of operation, many development and outreach activities occurred in the ATE program. NSF has made significant efforts to involve all interested parties in the continuing development of the program: two-year colleges, four-year colleges and universities, secondary schools, industry, and other government agencies. The focus has been on developing partnerships among several levels with two-year colleges in leadership roles. Activities included:

- *ATE Leadership Workshop* held in cooperation with the American Association of Community Colleges (AACC) and involving education leaders from two- and four-year colleges, universities, and secondary schools; leaders from industry with interest in technical education; and representatives from professional societies.
- *ATE Principal Investigator's (Pis) Conference* held in cooperation with AACC and involving the three FY94 ATE Centers, the 16 ATE planning grants for Centers, and approximately six of the large curriculum development projects. The conference was designed to help ATE award recipients begin to consider application of the ATE program beyond the parameters of their own projects and to consider how the entire ATE program can impact and improve the Nation's technological education.
- *Eight ATE Outreach Workshops* sponsored by DUE and ESIE and attended by many administrators and faculty members.
- *Participation in Professional Society Meetings* by DUE and ESIE program directors.
- ATE also supported a number of workshops and produced several notable NSF publications, including:

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- ◆ February, 1995: publication of the *Advanced Technological Education: 1994 Awards and Activities* (NSF 95-6).
- ◆ February, 1995: *Partnering to Build a Quality Workforce: Critical Issues in Environmental Technician Education* sponsored with the Environmental Advanced Technology Center. Report published August, 1995.
- ◆ March, 1995: publication of *Technical Education in 2-Year Colleges*.
- ◆ March, 1995: publication of *Putting the Pieces Together, A Guidebook for Leaders of Coalitions of Two- and Four-Year Colleges and Universities*.
- ◆ April, 1995: publication of *Activities in Support of Two-Year College Science, Engineering, Technology, and Mathematics Education: Fiscal Year 1994 Highlights* (NSF 95-74).
- ◆ April, 1995: Observance of first NSF Community College Day.
- ◆ May, 1995: Planning meeting held for the workshop to define a national agenda for the *Future of Engineering Technician Education in Two-Year Colleges*; workshop to be jointly sponsored by NSF, Accreditation Board for Engineering and Technology (ABET), American Society for Engineering Education (ASEE), and Sinclair Community College in October 1995.
- ◆ May, 1995: Initiation of regular column on NSF in the *AACC Community College Times*.
- ◆ June, 1995: Community College Presidents' meeting at NSF
- ◆ July, 1995: Planning meeting at NSF for a 1996 conference on International Technician Education.
- ◆ July, 1995: Participation of Program Directors from DUE in the Technology Reinvestment Program/ Manufacturing Education and Training (TRP/MET) Grantees PI Conference.

PROGRAM SUPPORT

The ATE program is supporting projects in instructional materials and curriculum development; laboratory development and enhancement; and faculty and teacher enhancement and preparation as well as six Centers in Advanced Technological Education.

The awards cover a wide range of advanced technological education fields including biotechnology, environmental technology, computer and information systems technology, chemical technology, manufacturing technology, electronics, geographic information systems technology, telecommunications, instrumentation and calibration technologies, and laser technology as well as mathematics, physics, biology, chemistry, and other core courses which serve to undergird such programs.

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In FY 95, the ATE program supported three new Centers of Excellence in Advanced Technological Education. These are:

- *The New Jersey Center for Advanced Technological Education* led by Middlesex Community College (NJ) is creating a new associate's degree program in engineering technology to meet the demand for multifunctional engineering technicians. This new program being developed by six community colleges is derived from combining mechanical, computer, telecommunications, and electronics technical programs. It begins in Grade 11, continues through the associate degree, and articulates with baccalaureate programs at New Jersey Institute of Technology for engineering technology programs and with Trenton State College's program in technology education to prepare secondary teachers of tomorrow.
- *The Northwest Center for Sustainable Resources* led by Chemeketa Community College (OR) is a collaborative effort of secondary schools, community colleges, four-year Institutions, industries, government agencies, Native American tribes, and international research groups. Associate degree natural resource technology programs are incorporating higher levels of mathematics and science, using an ecosystems approach that emphasizes sustainable methods of resource utilization. Program graduates enter employment as advanced technicians in a variety of science-based occupations including forestry, fishery, environmental restoration, and geographic surveying or continue for baccalaureate and other advanced degrees.
- Bellevue Community College (WA), in collaboration with other community colleges, secondary schools, four-year Institutions, industry, and government, is leading a new *Center in Information Technology* to respond to industry's need for well-trained technicians. This Center, with strong input from industry, is developing articulation standards and model associate degree programs particularly for information science and its application to other disciplines (fields). Microsoft and Boeing, as well as many small-to-medium-sized Seattle-area companies, are active partners in the Center, providing both personnel as well as financial resources.

The three new Centers join the following three Centers originally funded in FY 94:

- The *Advanced Manufacturing Center* housed on the campus of Sinclair Community College (OH), is a joint effort of Sinclair Community College, the University of Dayton, numerous local industries, and secondary schools. The Center significantly involves community colleges in three other states in the initial development stage, with further involvement planned in beta-testing stages. The Center is acting as catalyst to improve science, mathematics, and advanced manufacturing instruction by developing an advanced manufacturing curriculum beginning in Grade 11, continuing through the associate degree program, and culminating in a bachelor's degree. This curriculum also includes writing, pilot testing, and publishing curriculum materials, as well as national dissemination of the model program, its curriculum, and instructional materials.

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- The *Environmental Center* is a joint effort of Eastern Iowa Community College (IA), Kirkwood Community College, Hazardous Materials Training and Research Institute (HMTRI), and Partners for Environmental Education (PETE). This Center involves over 500 community colleges in their dissemination efforts. It is developing nationally-validated curriculum models and instructional materials; establishing comprehensive programs of professional development; serving as a clearinghouse for environmental education information; and providing a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies.
- The *Distance Education Consortium*, led by Texas State Technical College, Sweetwater (TX), involves many institutions in Texas, New Mexico, and Oklahoma. The project is developing the infrastructure and pedagogy to deliver technical courses in geographically widely separated colleges through distance learning. These include existing courses in CAD/CAM/CIM as well as new associate programs in polymer technology and electro-mechanical technology to complement needs of local industry.

In FY 95, the ATE program supported 36 new projects, including:

- * Seminole Community College (FL) is developing a new and innovative curricula for introductory college physics. The course targets students in technology courses, while maintaining the rigor that makes it transferable to four-year colleges and universities. It emphasizes a hands-on approach and motivates students to see connections between physics and their chosen fields.
- * Wentworth Institute of Technology (MA) is creating, through joint efforts of mathematics and technical faculty, laboratory investigations using engineering laboratories and multimedia simulations that illustrate and teach mathematical concepts.
- * Prince George's Community College (MD) is leading a consortium of 12 community colleges, each linked to a NASA Center to conduct faculty enhancement workshops in remote sensing, image processing, and geographic information systems. They are also developing an earth systems science course and interdisciplinary modules which can be infused into science and technology courses.
- * Johns Hopkins University (MD) is leading a consortium which represents five different community college consortia (including over 130 community colleges directly) to develop instructional modules in science, mathematics, manufacturing technology, and technical communications to infuse into courses that comprise a broadly accepted, portable associate's degree in manufacturing. Curriculum materials are based on SCANS competencies. The five consortia involved represent two state systems (California and New Hampshire), two industry systems (Boeing and AT&T), and one professional society.
- * Texas State Technical College, Waco (TX) is leading a multi-state effort to develop curricula and laboratory materials for student learning in advanced technologies for 15 occupational

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areas supporting American machining and machine tool industries. Key goals of the project include providing multi-skilled graduates, producing upgraded and new educational materials, working closely with college and industrial partners to validate competencies and materials, and preparing a national model for apprenticeships and internships.

- * The South Carolina Advanced Technological Education Exemplary Faculty Project (SC) is bringing together the 16 community colleges in the South Carolina system for intensive professional development activities. In addition, they are developing, pilot testing, implementing, and evaluating curricular reform in engineering technology programs across the state. Partners also include Clemson University, the South Carolina Department of Education, and businesses and industries across the State.
- * The University of Texas in Austin is developing a program for high school students with high potential for careers at technicians. The program emphasizes advanced technology, design, and applications. Computer-aided design projects are integrated into other components, and field trips to major industries give students the opportunities to learn what technicians do.

In addition to the specific ATE projects listed above, the ATE program also co-funded several projects with other programs. For example:

- ◆ For the four Chemistry Initiative awards, the ATE program contributed to assure that curricula developed through those projects is tested in and adapted for appropriate programs such as those that prepare chemical, environmental, or biomedical technicians.
- ◆ The ATE program contributed to the Biological Sciences Curriculum Study project. This curricula, which is being developed primarily for two-year college biology classes, is being class-tested and adapted for use in technical programs benefiting biotechnology and environmental science.

Other special projects supported through the ATE program include:

The development of the *AMATYC Standards for College Mathematics Below the Level of Calculus*. This set of standards, released in early September, 1995, has been developed with leadership from the two-year college community; however, members of the writing team also included four-year college and university faculty. It is being supported by all major mathematical societies. The ultimate goal of the project is to improve mathematics education and to encourage more students to study mathematics.

- ◆ Several national workshops being held to address important facets of technician education are being supported by ATE, including: *Critical Issues in Environmental Education* (February, 1995), *National Agenda for the Future of Engineering Technician Education* (October, 1995), the *Community College Science Connection Conference* (addressing articulation issues among two- and four-year Institutions, April, 1996), and *Ethics and Biotechnology* (January, 1996).

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- ♦ The American Association of Physics Teachers (AAPT) is establishing a network of physics faculty in two-year colleges which consists of 15 regional organizations, coordinated and linked by a national steering committee. The purpose is to help improve learning opportunities for students in two-year colleges, including those who transfer, those who become technicians in the high-technology workplace, and all students for whom physics serves as part of their college education.

AWARD STATISTICS

Since the total funds were divided between DUE and ESIE in the ratio of 2:1, for the FY 95 total of \$23.25 M, approximately \$15.5 M was provided by DUE and \$7.75 M was provided by ESIE. As can be seen in Table I, the out-year commitment in the ATE program is about \$11.85 million for FY96 and about \$5.45 million for FY97.

TABLE 1

Award Statistics for ATE for FY95 (Dollars in Millions)

Type	Number	FY95	FY96	FY97	Total
Centers New	3	\$2.99	\$2.88	\$2.90	\$8.77
Projects New	36	9.82	2.50	1.77	14.09
Centers Cont.	3	2.59	2.56	-	5.15
Project Cont.	12	4.40	3.08	-	7.48
Special	9	1.00	.46	.36	1.82
Other Programs	17	1.05	.37	.42	1.94
Leadership Actv.		1.21			1.21
Totals	80	\$23.25	\$11.85	\$5.45	\$40.55

As summarized in Table 1, ATE partially or fully supported 17 projects submitted to other programs but which directly benefited technician education. These included 3 Course and Curriculum Development projects, 2 Undergraduate Faculty Enhancement projects, 4 Chemistry Initiative projects, 2 Instrumentation and Laboratory Improvement projects, 3 Mathematics and Their Applications Across the Disciplines projects, 1 Instructional Materials Development project, 1 Research Project, and Young Scholars Project.

In FY 95, 39 of the 115 proposals submitted were funded, for a funding rate of 34%. These new awards went to Institutions in 25 States plus the District of Columbia. With those ATE projects continuing in FY 95, those co-funded with other projects, and new awards, ATE projects are currently being supported in 31 States plus the District of Columbia.

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Table 2 show the distribution of active awards in FY95 (new 1995 awards and those continuing from 1994) by type of technology.

TABLE 2

Award Distribution by Focus Area

	Continuing	New
Science Technologies including Biotechnology, Chemical Technology, Computer Technology, and Environmental Technology	11	10
Engineering Technologies including Manufacturing, Electronics, Aerospace Technology, GIS, Civil, Telecommunications, etc.	10	22
Core Courses including Mathematics, Physics, Technology Education, Multi-/Inter-disciplinary	10	7
<u>Special (AACC)</u>	<u>1</u>	
Total Awards	32	39

PROGRAM IMPACT

The projected national impact of the ATE program is large, especially that of the current six Centers and large curriculum and faculty enhancement awards. The Northwest Center for Information Technology estimates that, over a five-year period, it will affect over 5000 ATE college students, 350 ATE faculty and high school teachers, and 2700 high school students. The Environmental Center in the Eastern Iowa Community College District collaborates with Partners for Environmental Education (PETE) to involve over 500 community colleges in their dissemination efforts. They estimate that in the first three years of their award, they will directly impact 300 community college teachers, 300 pre-college teachers, and 5500 students. As an indirect effect, each of the 600 teachers is expected to teach an average of 100 students per year in environmental programs or literacy programs, yielding a projected impact of approximately 60,000 students during the award period.

The largest projects are faculty enhancement activities or curriculum development projects which plan to develop and test curriculum nation-wide. For example, The Miami University Middletown (OH) project plans to benefit 600 college faculty and pre-college teachers in faculty enhancement workshops and 20 in curriculum development efforts. Assuming each teacher or faculty member directly impacts 100 chemistry or chemical technicians students per year, this will result in 60,000 students ultimately being impacted by the project. Activities include curriculum development, instructional materials development, faculty and teacher enhancement, and student enhancement and outreach. An industrial internship program for high school and college teachers is also an important component of this project.

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PROGRAM ISSUES

As work becomes more interdisciplinary and team-oriented, technical education must find a way to educate students more broadly in both science, mathematics, engineering, and technology (SMET) and general workplace competencies. The improved articulation of curricula and classroom experiences in advanced technological education between secondary schools and two-year Institutions and between two- and four-year colleges and universities is an important goal of the ATE program. Additionally ATE projects seek to enhance career opportunities for graduates of two-year science and engineering technician programs, as well as maintain currency of teachers and faculty in fields which are undergoing rapid technological transformation. Some additional issues include:

- The exponential growth in the use of complex technologies requires that workers be technological literate, competent, and well-grounded in mathematics and science. Students must be prepared to not only enter the workplace with relevant skills, but also possess the flexibility to retool and adapt these skills as new technologies emerge.
- While industry and business ask for technological workers with good general mathematics and science training, they may tend to hire those with specific workplace skills and experiences.
- The associate degree should become a credential in science and engineering technology fields and should be recognized as such by industry.
- Many undergraduates educated in SMET courses become technicians, yet SMET education has often ignored the needs of students making such career choices.
- It remains vitally important to attract talented young people from diverse backgrounds to careers as technicians.
- The demands of the modern workplace are changing so rapidly that continuing education is needed for workers to stay abreast of their jobs and to prepare for career change. A related concern is maintaining the currency of ATE-supported projects in the face of rapidly changing industrial needs.
- Programs must ensure that technicians graduating from ATE-funded projects possess the higher level skills needed to help industry compete in the international arena.

FUTURE PLANS

The ATE program has initiated several activities for this coming year and beyond.

- ◆ It is anticipated that the ATE program will make awards for up to five new Centers of Excellence in Advanced Technological Education and multiple projects to expand and diversify the impact of the program.

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- ◆ The ATE program will continue to co-fund proposals submitted to other programs to help involve multiple institutions and to help assure that many Institutions consider education of the future workforce, including those who is work as technicians, an important component of their projects.
- ◆ Special projects that address important issues related to technician education will continue to be supported.
- ◆ More industry involvement in the ATE program is being sought.
- ◆ Appropriate active participation of four-year colleges and universities in ATE issues including project leadership, materials development, quality assurance, faculty and teacher development, and articulation is being promoted.
- ◆ The ATE program will more actively seek projects focusing on preparation of the future secondary school teachers and two-year college faculty who teach in these fields.
- ◆ Additional dissemination of products by publishers and other outlets such as electronic means, replication by other sites, and through workshops is being addressed.

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New FY95 ATE Awards by Technology

Type of Technology	State	Type	Length in Years	First Year Award		Total Award	
				ATE	Overall (in 1000s)	ATE	Overall (in 1000s)
BIOTECHNOLOGY							
Georgetown University	DC	PR	2	150	250	150	250
De Anza College	CA	PR	2	225	225	225	225
Hawkeye Community College	IA	PR	3	200	200	200	200
Natl. Assoc. of Bio. Teachers	VA	PR	4	499	499	499	499
subtotals				1074	1174	1074	1174
CHEMICAL TECHNOLOGY							
Southeast Community College	NE	PR	2	191	191	191	191
subtotals				191	191	191	191
COMPUTER AND INFORMATION TECHNOLOGY							
Los Rios Community College Sys. Distr.	CA	PR	2	50	50	50	50
Bellevue Community College	WA	CE	3	1000	1000	2992	2992
subtotals				1050	1050	3042	3042
ELECTRONICS							
Indian Univ.-Bloomington	IN	PR	3	300	300	300	300
North Seattle Community College	WA	PR	3	300	300	600	600
New Engl. Brd. of Higher Ed.	MA	PR	3	365	365	365	365
Front Range Community College	CO	PR	3	301	301	301	301
subtotals				1266	1266	1266	1266
ENGINEERING TECHNOLOGY							
Univ. of Georgia	GA	PR	2	98	98	98	98
Piedmont Tech College	SC	PR	3	474	474	1444	1444
Rose-Hulman Institute. of Tech.	IN	PR	3	475	475	475	475
Texas St. Tech Institute-Harlinge	TX	PR	1	100	100	100	100
Kansas St. University	KS	PR	1	75	75	75	75
Middlesex County College	NJ	CE	3	786	986	2566	2766
CUNY NYC Tech College	NY	PR	1	156	156	156	156
subtotals				2008	2008	2008	2008

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Type of Technology	State	Type	Length in Years	First Year Award ATE	Overall (in 1000s)	Total Award ATE	Overall (in 1000s)
ENVIRONMENTAL TECHNOLOGY							
Michigan Technical Univ	MI	PR	3	500	500	500	500
Univ. of Alaska SE Juneau	AK	PR	3	250	250	600	600
Trident Technical College	SC	PR	2	250	250	250	250
Stark Technical College	OH	PR	3	516	516	516	516
Chemeketa Community College	OR	CE	3	997	997	2999	2999
subtotals				2513	2513	4865	4865
GEOGRAPHICAL INFORMATION SYSTEMS							
Prince George's Community College	MD	PR	3	314	314	694	694
Indiana State University	IN	PR	3	300	300	300	300
subtotals				614	614	994	994
MANUFACTURING							
John Hopkins University	MD	PR	3	500	500	1300	1300
Northern Illinois Univ.	IL	PR	1	213	213	213	213
Wayne State Univ.	MI	PR	2	149	149	149	149
Regional Tech. Strategies	NC	PR	1	79	79	79	79
Univ. of Texas-Pan American	TX	PR	2	100	100	100	100
CO Community Col & Occup Ed. Study	CO	PR	2	181	181	298	298
Texas St. Tech. Institute.-Waco	TX	PR	3	550	550	1550	1550
Madison Area Tech. College	WI	PR	1	151	151	155	155
NC State Brd. of Community Colleges	NC	PR	2	119	119	119	119
Keene State College	NH	PR	3	250	250	548	548
subtotals				2295	2295	4446	4446
MATHEMATICS							
Wentworth Institute. of Tech.	MA	PR	3	492	492	492	492
SUNY Adirondack Community College	NY	PR	2	184	184	234	234
subtotals				677	677	726	726
PHYSICS							
Seminole Community College	FL	PR	3	429	429	429	429
Austin Community College	TX	PR	2	318	318	318	318
subtotals				748	748	748	748
(All amounts are in 1000's)				Grand Total	12361	11798	19360 19460

Key: PR= Project, CE= Center, ATE= Advanced Technological Education

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1994 Awards Continuing into 1995 by Technology Area

Type of Technology				Total Award	
			Length in Years	ATE	Overall (in 1000s)
BIOTECHNOLOGY					
California State University-Hayward	CA	PR	3	50	50
Peralta Community College	CA	PR	3	209	209
Middlesex Community College	MA	PR	3	1132	1132
Madison Area Technical College	WI	PR	2	1000	1000
subtotals				2391	2391
CHEMICAL TECHNOLOGY					
American Chemical Society	DC	PR	3	1500	1500
subtotals				1500	1500
COMPUTER INFORMATION TECHNOLOGY					
Maui Community College-U. of Hawaii	HI	PR	3	499	499
Center for Image Processing	AZ	PR	3	1347	1347
Minnesota Riverland Community College	MN	PR	2	500	500
subtotals				2346	2346
CORE AND ONE OR MORE SPECIFIC TECHNOLOGIES					
Texas St. Technical College	TX	CE	3	1612	1680
Amarillo College	TX	PR	3	630	630
West Valley College	CA	PR	3	300	300
subtotals				2542	2610
ELECTRONICS					
Alvin Community College	TX	PR	2	247	247
Portland Community College	OR	PR	2	200	200
Queensborough Community College	NY	PR	3	500	500
subtotals				947	947
ENGINEERING TECHNOLOGY					
Piedmont Community College	SC	PR	2	123	123
subtotals				123	123
ENVIRONMENTAL TECHNOLOGY					
Eastern Iowa Community College	IA	CE	3	2999	2999
Intelcom	CA	PR	3	1500	1500
Mesa State College	CO	PR	3	400	400
subtotals				4899	4899

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Type of Technology	Total Award				
			Length in Years	ATE	Overall (in 1000s)
GEOGRAPHICAL INFORMATION SYSTEMS					
Kansas State Univ. at Salina	KS	PR	3	500	500
subtotals				500	500
MANUFACTURING					
Sinclair Community College	OH	CE	3	3000	3000
Houston Community College	TX	PR	2	604	604
Mineteman Vocational School	MA	PR	3	185	185
Wytheville Community College	VA	PR	2	197	197
Penn State Univ-University Park	PA	PR	2	658	658
CAM-I: Consort. for Adv. Manu-Int'l	TX	PR	3	1500	1500
subtotals				6145	6145
MATHEMATICS					
Mt. Hood Community College	WA	PR	3	469	469
Middlesex County College	NJ	PR	2	169	169
Kentucky Community College System	KY	PR	3	696	800
subtotals				1336	1410
PHYSICS					
Concord Consortium	MA	PR	3	432	432
Henry Ford Community College	MI	PR	2	129	129
subtotals				562	562
SPECIAL					
American Assoc. of Community Colleges	DC	PR	1	19	19
subtotals				19	19
(All amounts are in 1000's)			Grand Total	82 23323	23495

Key: PR= Project, CE= Center, ATE= Advanced Technological Education

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Centers of Excellence

New 1995 Awards

Title: Northwest Center for Information Technology: New Designs for Advanced Technological Education

Neil Evans
Bellevue Community College
Bellevue, WA 98009-2037

DUE 9553727
FY1995 \$999,737
FY1996 \$992,386
FY1997 \$999,931

The Northwest Center for Information Technology coordinates a network of collaborative partnership of Bellevue Community College with the Boeing Corporation, Microsoft, other industries, two- and four-year colleges and universities, tech prep consortia, and secondary schools to support high standard advanced technological education in information technology and its application to other emerging technologies. A goal of the Center is to strengthen science, mathematics, and technical curricula; pedagogy ; and student support systems to provide the knowledge and skills base required for advanced technological education. Curriculum templates are designed to provide a model school through four-year college program. The program also includes refresher options for students lacking college level skills. A comprehensive system is developed to attract and retain students as well as monitor and assess their progress through core competencies, job placement, and education as well as development of courseware and the coordination of professional development programs for faculty and for professional technicians. Computer technology is applied to core science and mathematics, as well as to specific technological curricula. The Center has strong commitments of time, personnel, and financial support from major industrial partners.

Title: New Jersey Center for Advanced Technological Education

John Bakum
Middlesex County College
Edison, NJ 08818

DUE 9553749
FY1995 ATE \$ 785,997 (TOTAL \$ 985,997)
FY1996 \$ 982,931
FY1997 \$ 997,544

"Mecomtronics" describes a new program in engineering technology being created to meet the demand for a multifunctional engineering technician. "Mecomtronics" is derived from Mechanical/ COMputer/ teleCOMMunications/ elecTRONICS which identify the functional areas. To accomplish this the New Jersey Center for Advanced Technological Education through its member institutions is restructuring engineering technology education beginning in grade eleven, continuing through the associate degree, and articulating with the baccalaureate programs. During each of the three years of this project work is being done on interrelated curriculum, instructional materials development, faculty and teacher enhancement, and student outreach. The Advanced Technological Education Center is located at Middlesex Community College in New Jersey. Other academic institutions which are members of the consortium include: Essex County College (ECC), Mercer Community College (MCC), County College of Morris (CCM), Raritan Valley Community College (RVCC), the New Jersey Institute of Technology (NJIT), and Trenton State College (TSC). Each component of Center effort is being coordinated by a member institution: MCC is coordinating the curriculum development component; faculty development by CCM; the Student Outreach by ECC; articulation of high school associate degree and baccalaureate collaboration by TSC; strengthening partnerships with business and industry by NJIT; the NJCATE communications clearinghouse by MCCC; and, social, environmental and ethical issues by RVCC. An articulation agreement between the Mecomtronics program and Trenton State's baccalaureate program in technology education is helping to prepare secondary school teachers of tomorrow.

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Title: Northwest Center for Sustainable Resources (A National Center for Advanced Technology)

Wynn W. Cudmore
Chemeketa Community Col
Salem, OR 97309-7070

DUE 9553760
FY1995 ATE\$ 996,663 (TOTAL \$ 999,663)
FY1996 \$ 999,553
FY1997 \$ 999,227

The Northwest Center for Sustainable Resources (NCSR) is a collaborative effort of partners from Washington, Oregon, and northern California to create a national Advanced Technology Center of Excellence. The goal of the Center, coordinated from Chemeketa Community College, Salem, OR, is to enhance natural resources technology education programs at community colleges and secondary schools. Programs are expanding current math and science core requirements, particularly through the development of an environmental science core curriculum. As a nucleus for programmatic change, principles of environmental sciences emphasize an ecosystems approach to natural resources technology education. The Center's technician programs are producing graduates who can contribute to a workforce supporting sustainability in natural resources management. Employers in the Pacific Northwest and the nation from both private sectors and government agencies require employees with a broader understanding of biological and physical sciences, advanced skills in data collection and analysis, and abilities to utilize cutting -edge tools such as geographical information systems and other computer-aided technologies. These technicians are being increasingly sought by employers, and the NCSR is catalyzing programmatic changes necessary to meet these needs. Faculty and student internships bring real-world experiences to the programs. The project is accomplishing the following objectives:

1. Development and enhancement of natural resources curricula in forestry, fisheries, wildlife, agriculture, and other natural resources-based fields in a collaborative effort of community colleges and partners in the three-state region; dissemination of program products nationally and internationally.
2. Creation of a world-class electronic network to serve as an information exchange site for NCSR partners and others as well as a national clearing house for scientific information supporting natural resources technologies developed by researchers and educators.
3. Connection of NCSR programs with programs leading to bachelors and advanced degrees to produce "seamless delivery" of natural resources programs, improving articulation between all levels of education.

The NCSR is providing the leadership to enable NCSR partners to develop frameworks for advanced technological education, share innovative teaching methods, incorporate new technologies into existing programs, and serve as a repository and dissemination site for emerging information in environmental sciences and natural resources management.

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Title: Northwest Center for Sustainable Resources (A National Center for Advanced Technology)

Wynn W. Cudmore
Chemeketa Community Col
Salem, OR 97309-7070

DUE 9553760
FY1995 ATE\$ 996,663 (TOTAL \$ 999,663)
FY1996 \$ 999,553
FY1997 \$ 999,227

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ATE Continuing Awards: Centers of Excellence

Title: Advanced Technology Environmental Education Center - (ATEEC)

Ellen Kabat
Hazardous Materials Training and Research Center
Cedar Rapids, IA 52406

DUE 9454638
FY1994 \$ 999,961
FY1995 \$ 999,907
FY1996 \$ 999,998
Advanced Technology Education

The Advanced Technology Environmental Education Center (ATEEC), which is a joint effort of Eastern Iowa Community College, Kirkwood Community College, Hazardous Materials Training and Research Institute (HMTRI), the Partnership for Environmental Technology Education (PETE), and the University of Northern Iowa, involves over 500 community colleges in their dissemination efforts. The Center is developing nationally validated curriculum models and instructional materials; establishing comprehensive programs of professional development; serving as a clearinghouse for environmental education information; and acting as a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies.

The Center has established three broad goals: (1) Develop nationally validated curriculum models and advanced instructional materials; (2) Establish comprehensive programs of professional development; and (3) Build a clearinghouse to serve as a national center of environmental information and as a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies. The Center is providing leadership to enhance core and advanced mathematics and science and technology components of environmental education; utilize advanced electronic communications networks; focus upon meeting the needs of diverse learners; encourage instructional materials which utilize advanced technologies; and develop teaching and curriculum standards for environmental education. ATEEC is enhancing hundreds of faculty and teachers and improving the education of thousands of students throughout the nation.

Title: National Center of Excellence for Advanced Manufacturing Education (NCE/AME)

David T. Harrison
Sinclair Community College
Dayton, OH 45402

DUE 9454571
FY1994 \$ 1,000,000
FY1995 \$ 1,000,000
FY1996 \$ 1,000,000
Advanced Technological Education

The Advanced Integrated Manufacturing Center is a joint effort of Sinclair Community College and the University of Dayton to create a National Center of Excellence for Advanced Manufacturing Education (NCE/AME). The goal of the Advanced Integrated Manufacturing Center located on the campus of Sinclair Community College, is to redesign the infrastructure of technological education in manufacturing. The NCE/AME is being a catalyst for educational change to improve science, mathematics, and advanced manufacturing instruction at secondary school, community college, and university levels. The program is accomplishing the following objectives:

1. Developing a new competency-based, occupationally verified, seamless curriculum beginning in grade 11, through the Associate of Applied Science degree, culminating with the Bachelor of Science degree using advanced manufacturing as the focus; with gateways to and from industry employment throughout.
2. Writing, pilot testing, and publishing curriculum materials (laboratory manuals, video, software, and other ancillary materials) to improve mathematics, science, and manufacturing engineering technology instruction.
3. Disseminating the curriculum, curriculum materials, and model program nationally.

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Title: Southwest Center for Advanced Technological Education

Robert L. Musgrove
Texas State Tech Institute, Sweetwater
Sweetwater, TX 79556

DUE 9454643
FY1994 \$ 565,872
ATE : \$ 465,872
ILI : \$ 100,000
FY1995 \$ 585,290
FY1996 \$ 560,475
Advanced Technological Education

The Southwest Regional Center for Advanced Technological Education is a collaboration among two-year colleges, four-year colleges and universities, industries, and Tech Prep consortia in West Central Texas, New Mexico, and Oklahoma to provide technical education in a vast rural region through distance education. The project is developing the infrastructure and the pedagogy to deliver many technical courses through distance learning. These include existing courses in CAD/CAM/CIM which are being converted for delivery via distance learning to two-year institutions and secondary school sites. Faculty at two-year colleges are working with the Department of Education at Texas Technical College to develop new instructional materials. In particular, the Center is developing new AAS programs in polymer technology and electro-mechanical technology to complement needs of industry in the area.

Through an intensive effort at developing distance education and electronic networking in the consortium, the Center is enabling the member institutions to share their substantial resources, to deliver quality instruction throughout the area, and to exchange data and information rapidly and efficiently. This "center without walls" addresses the intertwined problems—distance, expense, and limited resources—inherent in delivering advanced technological education in such a large region. Its findings, strategies, tactics, materials, and methodologies constitute a significant contribution to technical education in the nation.

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PROJECTS

New 1995 Awards

Title: Preparation of Technicians for the Biotechnology Industry

Jack G. Chirikjian
Georgetown University
Washington, DC 20007-2197

DUE 9553661
FY1995 ATE \$ 150,00 (TOTAL \$ 250,000)
Advanced Technological Education

This project is focusing on (a) bringing together a coalition of educators, scientists, industrial partners, and curriculum developers to establish a strategy for the Tech/Prep Associate Degree technician preparation program; (b) developing a preliminary curriculum to provide "hands-on" enhancement opportunities for college faculty and preservice teachers in the area of biotechnology; and (c) recruiting two-year college faculty to test the curriculum materials in summer workshops. At the beginning of the project, the Coalition is meeting to determine the most effective strategy to initiate and address project goals and objectives.

The program is having both a direct and an indirect effect on preservice teachers in the area of biotechnology that includes: (a) two-year and four-year college faculty who are directly incorporating the curriculum in their Instruction, (b) the availability of materials that make it possible to incorporate the biotechnology curriculum into teacher education programs; and (c) participants on the Steering Committee and Advisory Board who are integrating these materials in their preservice education programs.

Title: Remote Sensing, Image Processing, and Geographic Information Systems

Patricia A. Cunniff
Prince George's Community College
Largo, MD 20772

DUE 9553662
FY1995 \$ 313,973
FY1996 \$ 293,427
FY1997 \$ 87,541
Advanced Technological Education

Community Colleges for Innovative Technology Transfer, Inc. (CCITT), a consortium of 12 community colleges across the United States all linked with a local NASA Center, is conducting six faculty development workshops (two each) in remote sensing, image processing, and geographic information systems. An earth systems science course with a self-standing laboratory utilizing remote sensing, image processing, and geographic information systems is being developed as well as an interdisciplinary curriculum module having multiple strands which utilize the technologies above. The interdisciplinary modules can be infused into science and technology courses at CCITT institutions and other community colleges throughout the United States.

Community college members of CCITT include: Brevard Community College, FL; Cuyahoga Community College, OH; Foothill-DeAnza Community College District, CA; John C. Calhoun Community College, AL; Pasadena City College, CA; Pearl River Community College, MS; Prince George's Community College, MD; Thomas Nelson Community College, VA; and Houston, TX-based Consortium for Aeronautical Technical Education composed of San Jacinto Community College, College of the Mainland, Alvin College, and Lee College.

NASA Headquarters and local NASA Centers are supporting the faculty development/curriculum work. The remote sensing workshops are being held at NASA Goddard Space Flight Center in Greenbelt, Maryland with a portion of the instruction being provided by NASA scientists and engineers. Scientists from AMES are involved with the two image processing workshops to be held at Foothill College. Individuals from academe and industry with GIS experience are supporting the two GIS workshops.

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Title: Associate Degree for Manufacturing Technicians

Arnold H. Packer
Johns Hopkins University
Baltimore, MD 21218

DUE 9553664
FY1995 \$ 499,967
FY1996 \$ 400,000
FY1997 \$ 399,867
Advanced Technological Education

This project is developing 6 instructional modules in science (3), mathematics (1), manufacturing technology (1), and technical communication (1) which can be infused into 4 courses and, thereby, assist in the creation of the foundation for a broadly accepted portable associate degree in manufacturing. Students are being brought 8 of the 22 generic standards developed by a national panel of educators and employers in 1994. The standards are based primarily on the competencies defined by the Secretary's Commission on Achieving Necessary Skills (SCANS). Multidisciplinary teams of mathematics, science, and technology faculty are designing a series of CD-ROMs and print materials for the instructional modules. The materials are being produced by the Educational Film Center. The design teams come from 5 Lead Colleges representing 5 consortia of community colleges, which include over 130 colleges. The Lead Colleges are implementing the revised curricula and disseminating the results to consortia members. Two consortia are state systems - California and New Hampshire, two are industry-based - Boeing and the Alliance of AT&T and its union, the last is the Consortium for Manufacturing Competitiveness. Affiliate Colleges also implement the instructional modules. National boards, which include representatives of the American Association of Community Colleges, the National Association of Manufacturers, the five consortia, industry, and related community college efforts are guiding the design and implementation of activities and helping disseminate the results to community colleges and employers across the nation. A formative and summative evaluation is being undertaken by the American Institute for Research.

Title: Introductory College Physics 2000 - ICP/2

Alexander K. Dickison
Seminole Community College
Sanford, FL 32771

DUE 9553665
FY1995 \$ 429,521
Advanced Technological Education

The project is developing a new and innovative curriculum for introductory college physics to be known as Introductory College Physics 2000 (ICP/2). This algebra-based course is modular since its genesis is the Principle of Technology Modules developed in the 1970's. ICP/2 is being made available in hard copy, but IBM and MAC versions on CD-ROM are emphasized since they allow the instructor using the material to edit it before printing for classroom use. The new curriculum incorporates what is now known, through studies in cognitive science, about teaching strategies that improve student learning. The modules are being developed to introduce activities designed to enhance a student's conceptual understanding and ability to make connections to related ideas.

Introductory College Physics 2000 targets students in technology courses, although it is suitable for all college students. With the introduction of Tech Prep and similar programs, more technology students are taking college physics. Each module in the new curriculum uses modern technological devices to introduce physics concepts. This motivates technological students and helps them see the connections between physics and their chosen fields. This college physics course maintains a rigor that makes it highly transferable to universities. It emphasizes a hands on approach and introduces all major concepts of introductory physics. However, it is the philosophy of ICP/2 that it is more important for students to fully understand fewer basic concepts and have confidence in applying them to new situations than it is for them to be exposed to more ideas that are neither understood nor remembered. Project ICP/2 involves consultants and two other community colleges in Washington and Pennsylvania. During the first year, advisory boards and other writing centers are being formed.

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Title: A Chemical Engineering Technology Advanced Process Operations Program

Edward R. Fisher
Michigan Technological University
Houghton, MI 49931

Proposal: DUE-9553671
FY1995 \$499,996
Advanced Technological Education

This three year project is developing an innovative two-year degree program in Chemical Engineering Technology: Advanced Process Operation. The project draws upon a strong partnership among Dow Corning Corporation, Dow Chemical Company, Delta Community College, and Michigan Technological University. The degree program consists of a first-year program taught at Delta Community College where high school articulation agreements and diversity outreach initiatives are well established. Due to proximity, work internships are available with industrial partners. Upon successful completion of this first year experience based on academic performance and work related recommendations, students transfer to the second year academic program at Michigan Tech. The second year stresses engineering technology with a strong laboratory component leading to a capstone experience in the new multipurpose pilot plant facilities of the Process Simulation and Control Center. Cooperative and apprentice experiences are available during the second year.

The Partnership enables the development and implementation of a model program to lead to highly trained process operators who are comfortable with new process technologies, regulations which shape these industries, and safety and teamwork skills which are adaptive to the changing high performance workplace of the future.

Title: A Chemical Technology Curriculum and Materials Development Project

John V. Kenkel
Southeast Community College
Lincoln, NE 68520-1227

DUE 9553674
FY1995 \$ 191,590
Advanced Technological Education

Southeast Community College in partnership with the University of Nebraska at Lincoln is directing a curriculum and materials development project for the first-year chemistry course in two-year college chemical technology programs. The specific objectives of the project are to create: (1) a national model for the introductory chemistry portion of the curriculum, and (2) disseminable materials that can be used with the model curriculum. The model and written materials are utilizing industrial examples and the new voluntary industry standards (VIS) with the goal of developing a mind set in students that prepares them for their chosen careers. With this background, students also better prepared for their second year courses in analytical chemistry, organic chemistry, and biochemistry which builds on this base. In addition, consideration is being given to transferability to four-year colleges and universities.

Written materials are being produced as the project unfolds. These materials initially take the form of modules representing individual subject areas. The authors are using industrial processes/topics to introduce and support each subject area and are deriving basic chemical principles from the processes described. Such a theme-based or "story line" approach is unique, but effective, in creating the desired mind set. The project is examining the newly-developed VIS and incorporating those that are relevant to the subject matter presented. The modules when completed is being published in the form of a textbook. Prototype CD-ROMs are being produced to accompany some of the modules with the intent of supporting and reinforcing the subject matter. Field testing is taking place at Southeast Community College, University of Nebraska-Lincoln, and Athens State Technical Institute in Georgia. Further dissemination and voluntary field testing is taking place via a network of colleges formed as part of an earlier grant.

The principal investigators are approaching the tasks with the thought that further reforms of the chemical technology curriculum (i.e., the second academic year) and the production of additional CD ROM materials will take place as part of future projects.

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Title: Using Multimedia Technology to Enhance Electronics Engineering Technology Programs

Dorothy J. Harnish
University of Georgia
Athens, GA 30602

DUE 9553676
FY1995 \$ 97,975
Advanced Technological Education

The project is a collaborative effort of six technical institutes, a public land grant university, a state department of technical and adult education, and industry representatives to develop applications for multimedia and distance learning technologies in Electronics Engineering Technology associate degree programs in Georgia. The project is focusing on faculty development activities. Twenty-four technology faculty are being trained in multimedia applications. This is being accomplished through a series of three-day workshops in multimedia development, held at Augusta Technical Institute. Materials developed by individual faculty in these workshops are being shared among the 24 faculty in the six technical Institutes to expand the impact of this training activity. In addition, six faculty members are receiving advanced training in the creation of multimedia applications. Evaluation and sharing of multimedia materials and applications in instruction is being facilitated through two follow-up meetings of all project faculty later in the year.

Title: Rural Alaskan Environmental Education Program

Gary L. Bowen
University of Alaska SE Juneau
Juneau, AK 99801-8625

DUE 9553680
FY1995 \$ 250,000
FY1996 \$ 250,000
FY1997 \$ 100,000
Advanced Technological Education

The University of Alaska Southeast is developing and implementing the Rural Alaskan Environmental Education Program. The project is establishing a centralized educational center at the UAS Sitka Campus, as well as a system for dissemination of curriculum to teachers and students in remote villages throughout the State. The program is modeled on the recommendations of the Federal Field Working Group on Rural Alaska Sanitation Problems and represents a cooperative effort of secondary/postsecondary educators, native leaders, and those State and Federal agencies responsible for environmental programs in the State of Alaska. The program addresses a critical public health need, throughout Alaska and other rural settings, for environmental scientists and sanitation technicians. It is designed to establish cultural awareness of the linkage between the environment and public health, engaging village youth as agents of change.

The program is providing a cross-disciplinary curriculum in an articulated 2+2 tech-prep format for grades 11-14. Curriculum components encompass an academic core (math, written and oral communications, social science); laboratory science (chemistry, microbiology, geology, climate) and systems technology (hydraulics, mechanics, electronics).

Students are completing a systematic program leading from secondary diploma to postsecondary associate degree, along with field experience necessary to achieve technician certification under Alaska regulations for operation of water and wastewater treatment, distribution, and collection systems. An academic and career counseling program, based on professional mentoring and service learning, is assuring that students completing the program are prepared both for transfer to baccalaureate degree programs and for transition into the workforce in rural Alaska.

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Title: Advanced Dimensional Metrology and ISO9001 Educational Partnership Program

Robert L. Brown
Madison Area Tech College
Madison, WI 53703-2285

DUE 9553684
FY1995 \$ 155,036
Advanced Technological Education

This project is providing employees skilled in metrology and ISO 9001 to the engineering, manufacturing, and service industries. To achieve this goal, a collaboration is being established between the Machine Tool Program at Madison Area Technical College, the suppliers and users of precision measuring, the University of Wisconsin Center for Quality and Productivity Improvement, the Madison Metropolitan School District, and the Wisconsin School-To-Work Initiatives; as well as articulation from other secondary and postsecondary educational institutions and professional organizations. This project is a well-coordinated, highly integrated effort to: 1) develop and disseminate curriculum materials specifically designed for technical training at the two-year associate degree level; 2) provide teacher enhancement activities in advanced dimensional metrology and ISO 9001 that include summer Institutes, mentoring, and curriculum development partnerships for associate degree and secondary school teachers.

Title: Electronics Technology Curriculum Development

Brenda L. Bryan
Front Range Community Col
Westminster, CO 80030-2105

DUE 9553685
FY1995 \$ 301,783
Advanced Technological Education

In this project interdisciplinary curriculum development teams are designing, developing, and implementing a flexible and modular electronics curriculum. This curriculum integrates academic and cutting edge technical skills with innovative instructional technology to produce job skills for industry. The curriculum focuses initially on DC Fundamentals and AC Fundamentals with beginning work in Solid State Fundamentals and Digital Fundamentals. Project is combining the resources of Front Range Community College, Colorado State University School of Occupational and Educational Studies, and local secondary institutions. Innovative, competency-based instructional modules that utilize a combination of task-oriented and student-oriented methods are being designed. Multi-media techniques are supporting both consistency and flexibility of instruction and delivery. Results, techniques, and modules are being shared through publications and conference presentations.

Title: Development and Field Test of a Supplementary Welding Lab on Disk for Teachers and Students

Xueshu Song
Northern Illinois Univ
De Kalb, IL 60115

DUE 9553687
FY1995 \$ 213,851
Advanced Technological Education

This project is developing a sophisticated interactive computer simulation software package to supplement and complement hands-on welding laboratory experiences for welding technology students. The project integrates the development of instructional media, teacher enhancement, and instrumentation and laboratory improvement via a coalition of Northern Illinois University and Rock Valley College, a two-year college in the northern Illinois region. The goals of the project are to enhance students' understanding of the interdisciplinary nature of advanced welding technology, to minimize laboratory-related costs, hazards, and environmental pollution, to motivate teachers via application of computer simulation and research participation, and to attract women and minorities into advanced technology programs. Preliminary development and research findings, documented by recent publications by the principal investigator, have shown that the software to be developed results in good engineering economy and high pedagogic effectiveness. An advisory and evaluation board of outside experts are providing additional expertise and experience. The project complements future research and development activities leading to "Advanced Technology Labs on Disk."

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Title: Foundation Skills for Advanced Technology

Stephen B. Rodi
Austin Community College
Austin, TX 78768-2285

DUE 9553689
FY1995 \$ 318,715
Advanced Technological Education

This project is producing and field testing instructional materials intended to develop foundational skills for careers in advanced technology. The course is aimed at eleventh and twelfth grade students but is applicable to other student populations as well. The course focuses on topics and skills in mathematics, physics, and engineering. It emphasizes understanding of ideas and the natural interplay of mathematics, physics, and engineering in solving problems. It intends to provide an alternative to the routine, rote, and worksheet driven curriculum which sometimes characterizes beginning instruction for students interested in technological careers. The course is built around ten problems, each problem associated with an instructional module. Students work in cohorts of four to solve problems. Each problem requires students to use instruments, collect data, understand the mathematics and physics related to the problem, and write up and present solutions in a group setting. Mathematics and physics is taught as a seamless whole related to real problems in a setting in which, it is hoped, students see group effort as the most effective route to success. The course may be an alternate or re-entry path back to the regular science curriculum or lead to advanced degrees in science and engineering technology. Faculty and teacher development activities are an important component of the project.

Title: The Southeast Michigan Alliance for Reinvestment in Technological Education (SMARTE) Project

Mulchand S. Rathod
Wayne State University
Detroit, MI 482023900

DUE 9553692
FY1995 \$ 149,900
Advanced Technological Education

Seven community colleges are part of SMARTE (Southeastern Michigan Alliance for Reinvestment in Technological Education) as well as K-12 school systems, a major state university, community-based organizations, government agencies, labor, business, and industry interests in southeastern Michigan.

The goals of the project include:

1. Development of a SCANS based model for manufacturing program, which maps the standards in each of three disciplines: product design, industrial controls, and manufacturing. Specific tasks to be accomplished involve: identify of skill standards which relate to engineering technologies, organize workshops to review skill standards, create model competencies, study professional organization certification procedures, and provide access to the information on curriculum and certification via WWW SMARTE alias.
2. Establishment of pilot enrichment programs for students who are beginning preparation for coursework in the technologies as early as elementary school grades. This results in holding at least one two-week intensified summer institute for the local public school students, and at least two workshops at community college sites to encourage elementary and middle school students, primarily minorities and females, into technology fields.
3. Development of curriculum in product design, which is being shared with faculty and teachers of the consortium through a "hands-on" workshop.

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Title: Advancing Geo-technology Education: Providing GIS Remote Skills for the Workforce of the Twenty-First Century

William A. Dando
Indiana State University
Terre Haute, IN 47809-0001

DUE 9553694
FY1995 \$ 300,000
Advanced Technological Education

The Department of Geography and Geology of Indiana State University is introducing twenty-five community college instructors to the principles of Geographic Information Systems (GIS), one of the fastest growing employment fields in the 1990s. Designed to promote the adoption of GIS as an integral part of numerous technically-oriented instructional programs in two-year colleges, this model program is taking the needed first step in supplying the workforce in the Midwest with technicians educated in the use of this rapidly growing technology. Working in teams of two or three community college instructors from the same institution, participants are acquiring the basic principles of GIS in two 3-week summer Institutes and in one continuing education class. They are learning the many ways in which this technology is used today in business, government, and industry. The immediate aim of this project is to give participants sufficient familiarity with GIS principles and knowledge of software and its utility so that they can return to their campuses with enough expertise to begin to incorporate this technology into existing courses. The long-term aim envisions participants establishing discrete GIS-education programs at their institutions. To ensure realization of project goals, consultants from two-year colleges with successful GIS programs are advising in organizing all institution programs and are part of the summer institutes' teaching teams. A two-year college faculty member is serving as project evaluator.

Close cooperation of the Robinson, Illinois campus of Illinois Eastern Illinois Community Colleges and the Terre Haute campus of Indiana Vocational Technical Institute is assured with the inclusion of faculty teams from those two institutions receiving GIS instruction in the summer institutes and by providing these institutions with hardware and software to help facilitate employment of GIS into their existing courses. Development of introductory courses in GIS and integration of GIS into existing courses at these two institutions are among the primary aims of the project.

Title: Integrating a New Vision in Environmental Sciences Technology (INVEST)

Catherine Almquist
Trident Technical College
Charleston, SC 29423

DUE-9553696
FY1995 \$250,647
Advanced Technological Education

This two year project encompasses curriculum development, faculty enhancement, and instrumentation and laboratory improvement. It addresses two different but equally important post secondary education issues. The first is the lack of educational opportunities available to environmental education students at the secondary and post secondary level of studies. Curriculum activities include development of: (1) a curriculum for a course in X-Ray Fluorescence Analysis of Lead Based Paint and Building Materials; (2) stand-alone laboratory experiments in analysis of lead in drinking water, GIS applications in environmental assessment and remediation, and gas chromatography/mass spectrometer sugar analysis identification of viable airborne organisms; and (3) environmental application for integration into math, science, and technology courses. Opportunities for faculty enhancement are being provided through internships with industrial partners, as well as participation in conferences and workshops. A curriculum work group, composed of project partners, is facilitating a comprehensive approach to materials development and sharing of expertise. A one week faculty training institute is being held in the second year of the project to disseminate course materials and train instructors in advanced technologies. A variety of activities designed to increase career awareness in secondary and post secondary minority student populations are planned for both years of the project.

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Title: New Technologies, Techniques and Technical Skills in the Manufacturing Economy: Reinventing Community Colleges

Stuart A. Rosenfeld
Regional Technology Strategies
Chapel Hill, NC 27514

DUE 9553698
FY1995 \$ 84,184
Advanced Technological Education

Regional Technology Strategies, Inc. in partnership with the American Association of Community Colleges, the National Association of Manufacturers, and the Southern Growth Policies Board, is designing, supporting, and implementing two major symposia (one in the South and the other in the Northeast) that focuses on how two-year educational institutions can better meet the needs of modern, high value, high performance manufacturers. The symposia are intended 1) to inform education and training policy makers about changes and opportunities in technical occupations in advanced manufacturing, 2) to deepen understanding of the emerging industrial modernization system, 3) to identify obstacles and opportunities to improve performance, and 4) to develop a clear vision of how to make the needed improvements. Attendees include presidents of member colleges, chancellors of state systems, and directors of state modernization programs, school-to-work transition programs, and economic development agencies. Each chancellor is being asked to submit names of others (e.g., presidents, legislators, board members) to be invited from their states.

The host organization in the South is the Consortium for Manufacturing Competitiveness, a group of leading technical colleges started and incubated by the Governors and legislators of the southern states. In the Northeast, a new alliance of college systems is hosting the symposium. The objective of each symposium is to accelerate and support industrial modernization with improved technical education and services that build demand for small and medium-sized manufacturers to better utilize technical skills.

Title: Interdisciplinary Courses in Electronics Manufacturing

Elaine M. Cooney
Indiana U Bloomington
Bloomington, IN 47402-1847

DUE 9553699
FY1995 \$ 297,475
Advanced Technological Education

This project is leading to the development of interdisciplinary courses for electronics manufacturing education that provide highly-trained technicians to U.S. industry. A wide range of activities that include all three subcategories of "Advanced Technological Education Projects" are necessary to meet this goal. First, associate degree faculty expertise are being enhanced with industry fellowships, workshops, and seminars. With better understanding of industry needs, these faculty, along with a practicing engineer from the Electronic Manufacturing Productivity Facility (EMPF), are developing three new courses that are the basis for a new degree option. The laboratories which accompany these courses use facilities belonging to industry partners, the EMPF, and the schools, along with equipment purchased under the Instrumentation and Laboratory Improvement section of this grant. Additional activities, centering around the Mobile Electronics Manufacturing Line and the EMPF, link secondary teachers and students with associate degree faculty, practicing engineers, and technicians. Such activities facilitate secondary teacher enhancement and curriculum development.

Title: Regional Center of Excellence for Precision Manufacturing Technologies

Wayne Wells
Rio Grande Center for Manufacturing
Edinburg, TX 78539

DUE-9553701
FY1995 \$100,340
Advanced Technological Education

Precision manufacturing, particularly tool, die and precision machining and related manufacturing technologies including plastics molding and metal stamping are an important segment of the Rio Grande Valley regional economy and the national economy. A new model educational program is being developed to create skilled workers who can

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participate on workplace teams in concurrent engineering. The model is based on the historical guild with master technologists and students working side by side performing productive work in a learning environment. A consortium of other colleges and local industries is being created.

Title: Mathematics for Technology - Laboratory Investigations

Gary M. Simundza
Wentworth Institute of Tech
Boston, MA 02115-5998

DUE 9553704
FY1995 \$ 499,951
Advanced Technological Education

Mathematics faculty at Wentworth Institute of Technology have been employing active learning strategies characteristic of the calculus reform movement at all levels of mathematics courses for students of engineering technology since 1989. This student population is motivated primarily by perceived relevance of subject matter to specific technical problems.

The project is developing, through joint efforts of mathematics and technical faculty, laboratory investigations using engineering laboratories and multi-media simulations that illustrate and teach mathematical concepts. The project begins at the intermediate algebra/trigonometry level and continues through calculus. 50 sections per year, containing 1500 students, are being affected at Wentworth. Through an existing network of Tech Prep consortia, Wentworth is taking the lead in extending the secondary level "integrated curriculum" reforms of Tech Prep to the college level. Collaboration among faculty from Wentworth and neighboring colleges and secondary schools involved in Tech Prep, as well as selected industry personnel, is resulting in a series of workshops and minicourses to disseminate materials and methods developed at Wentworth to mathematics teachers at New England area institutions, affecting a potential 25,000 Tech Prep students.

The Wentworth project serves as a national model for colleges of engineering technology in integrating the learning of mathematics with technical applications. Through the American Society for Engineering Education (ASEE) and the American Mathematical Association of Two-Year Colleges (AMATYC), a potential 100,000 additional students may ultimately be affected.

Title: Problem-Based Learning: A Key to Enhanced Performance in Advanced Technological Education

Buck F. Brown
Rose-Hulman Institute of Technology
Terre Haute, IN 47803

DUE 9553705
FY1995 \$ 475,000
Advanced Technological Education

Education in the United States is at a pivotal juncture. U.S. citizens must compete in a demanding global society, but our educational systems are struggling with outdated approaches and stagnant budgets. The "knowledge explosion" of the past 20 to 30 years has provided advanced technological education with a singularly difficult challenge. The traditional answer to this "knowledge explosion" has been to pack more "essential facts" into the curricula. Careful consideration of this issue suggests that an information-laden society requires resourceful skills, insights, and abilities; hence, educational innovation must focus less on facts and more on problem solving and inquiry-based learning. The Wabash Valley Educational Alliance is implementing an important educational vision and establishing a permanent cooperative effort within the Wabash Valley (west central Indiana). This project addresses instructional methods that impact the education of students of technology, science, mathematics, and engineering in two year, associate degree granting institutions. It is affecting educational approaches at all levels of technology; producing new curricula materials including problems and examples; providing a "living" video series of applications; and creating a national, refereed, electronic database for sharing problem-based materials and experiences. Problem-based instruction concentrates learning around "real-world" problems similar to those encountered by practitioners in the field. In problem-based learning the teacher's role changes quite dramatically from that in a traditional learning situation. The teacher must guide the students in the problem-solving process, directing them through questioning techniques. Problem-based learning helps students become critical thinkers and

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problem solvers. There is significant potential for its further refinement and widespread application to advanced technological education. This potential, if fully developed, can place technological education in a leadership role and heighten its visibility among the professions.

Title: Rocky Mountain Advanced Technology Education Project

Don E. Goodwin
Colorado Community College System
Denver, CO 802042554

DUE 9553706
FY1995 \$181,170
FY1996 \$117,294
Advanced Technological Education

In recognition of the importance of metrology in advanced manufacturing and to the future of the United States' economy, the Colorado Community College and Occupational Education System (CCCOES) is undertaking the Metrology Curriculum Development Project which involves curricula development, laboratory development, faculty in-service, and professional development for regional and national dissemination. This program is being developed at the Community College of Aurora, which is improving and modernizing its existing Associate of Applied Science Degree in Metrology / Precision Measurement program offered at the Higher Education Advanced Technology Center (HEAT Center). The project team is seeking input and direction from its Advisory Council from the National Institute of Standards and Technology (NIST) and the National Conference of Standards Laboratories (NCSL), as well as from industry.

The specific outcomes of the Metrology Curriculum Development Project include pedagogical strategies that will reconceptualize metrology education nationwide. The project provides opportunities to enrich a variety of curriculum in advanced technology education by incorporating the following elements:

1. the use and integration of distance learning and in the instructional strategy;
2. effective articulation model;
3. development of national standards for metrology education in cooperation with NIST and NCSL;
4. a model for professional advisory council associated with metrology; and
5. development of "Information CD" for direct distribution, as well as information dissemination on INTERNET and CD format.

Title: Advanced Biotechnology Education Project

Shahla Sheikholeslam
De Anza College
Cupertino, CA 95014-5702

DUE 9553708
FY1995 \$ 225,306
Advanced Technological Education

The proposed project is developing an advanced biotechnology education program that can serve as a satellite model program for other community colleges in California and the nation. The fundamental objective is to advance and broaden students knowledge and hands-on experience in the area of biotechnology. The new laboratory instructional materials are fostering technical education and are helping students gain marketable skills for the workforce.

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Title: Collaborative Model for Technician Education Through Interactive Technology

J. Parker Chesson
North Carolina State Board of Community College
Raleigh, NC 27603-1379

DUE 9553709
FY1995 \$ 120,000
Advanced Technological Education

The North Carolina Community College System is developing a program focused at the 11th and 12th grade levels and at the community college level for engineering technology students preparing to enter the manufacturing workforce. The underlying precept of the project is that workers at all levels of manufacturing must formulate and derive solutions to problems. These workers must enter the workplace with competence in numerical methods including statistics, probability, rate of change, and conversions as well as using computers and networks and other sophisticated mathematical tools and information technology to solve problems. Students are being taught the same powerful problem-solving strategies that are used in the manufacturing industry and are solving these problems by developing critical thinking skills and using multimedia and interactive technology in networked collaborative learning environments. Students learn to develop solutions to real problems in a high technology virtual workplace classroom. Through partnerships with industry, universities, community colleges, and high schools, new models of faculty enhancement and instructional materials development are being used.

Colleges of Education at universities in cooperation with the manufacturing industry and non-profit technology institutions in North Carolina are providing both in-service and pre-service professional development and technical support to high school and community college faculty. In this new model for technician education, the classroom is becoming a virtual workplace for students to gain experience and confidence in solving real problems facing engineering technicians in manufacturing, and to share experiences on problem-solving strategies used in manufacturing.

Title: Machine Tool Advanced Skills Technology Educational Resources (MASTER) Program

John D. Pierson
Texas State Technical Institute Waco
Waco, TX 76705

DUE 9553716
FY1995 \$ 550,000
FY1996 \$ 500,000
FY1997 \$ 500,000
Advanced Technological Education

This project is a multi-state effort to develop curricula and laboratory materials for student learning in advanced skills technologies for fifteen occupational areas supporting the American machining and machine tool industries. The Machine Tool Advanced Skills Technology Educational Resources (MASTER) Program is designing, developing, testing and disseminating new curricula materials for AS/AAS degree options in machining and metals related technologies. Since these occupational areas generally require some form of apprenticeship or internship, these educational materials are also designed and prescribed for use with industry partners. The problems addressed by this project are: (1) the use of outdated curricula materials by schools and colleges; (2) fewer students entering programs of study in these career fields that are highly important to the nation's economy in aerospace, metals, and manufacturing; (3) the rapid evolution of new multi-task machine tools that have reached beyond the capabilities of many existing technicians; and (4) the lack of rigorous college level programs that are needed to prepare a target audience of knowledge based workers in advanced problem solving skills. Four key goals are being addressed by the MASTER Program: (1) to provide more technical graduates that are multi-skilled in new machining tools and support related technologies; (2) to upgrade curricula and laboratories in these technical fields which are critical to the success of our nation; (3) to offer college-level training to existing industry employees to become multi-skilled with new and highly advanced equipment; (4) to establish realistic opportunities for college and industrial partners to validate competency requirements, and prepare a national model for apprenticeship/internship with prescribed laboratory work experiences; and (5) to disseminate the new curricula and educational materials nationally. This collaborative effort brings together six of the nation's leading two-year colleges, geographically dispersed, in areas

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of high demand, with identified public school and industry partners. Significant potential national outcomes include the survival of many critical industries and technical jobs.

Title: Theme Curriculum: An Integrated Curriculum Development Project In Support of Advanced Technology Education

Dave Sinclair
Los Rios CC System Office
Sacramento, CA 95825-3905

DUE 9553717
FY1995 \$ 50,000
Advanced Technological Education

The purpose of this project is the development of an integrated curriculum project in support of advanced technology education. Initially, the project serves approximately Design Technology, Engineering Technology, and Engineering students from American River College. Later, as a model, it will serve students from the entire community college district and potentially the state.

The Core of the program is theme curriculum. Theme curriculum is a product, and its interrelationship with business and community, that is being developed through a cohesive two year technical program. Its goal is to develop an integrated and diverse connection allowing individuals educational flexibility through exposure to application. It is simulating the actual community of people, business, community planning, product design, manufacturing, and testing. To complement this core theme, the curriculum includes situations that simulate the workplace within a professional studio environment.

Theme curriculums expose students to the expectations and standards required by business and industry. A student completing this program will have diversity in technical knowledge and skills to function effectively in any business or be able to act as an entrepreneur. Theme curriculum cycle every two years; thereby, exposing incoming students to the entire process. A model is being developed and implemented that can be used at secondary schools to encourage students to enter a technical career. 2+2+2 articulated programs are being developed to allow students opportunities to obtain an advanced technical education or obtain skills so they can work. Theme curriculum encompasses the community concept and is diverse enough to teach mechanical, civil, electrical, and architectural disciplines. The curriculum is integrated with other campus programs and is a model for equity programs such as LINKS, Women in Technology and MESA/MEP. It also serves as a regional training model for high school teachers, engineering technology - tech prep instructors, and retraining for displaced government and private industry workers. It provides all citizens the opportunity to obtain technical knowledge and skills to compete in the marketplace.

Title: High Quality Biotechnology Education

Kathleen Frame
National Association of Biology Teachers
Reston, VA 22090

DUE 9553720
FY1995 \$ 499,239
Advanced Technological Education

The National Association of Biology Teachers (NABT) is conducting a project using the Life Technologies, Inc.(LTI): GIBCO BRL Training Center laboratories in Germantown, Maryland. Two-year college faculty in partnership with high school teachers from across the nation are being updated on cutting-edge biotechnological research and procedures. Teamed with scientists and technicians from industry, these teachers are developing an innovative educational model to rapidly adapt the advanced techniques and sophisticated equipment of modern biotechnology to inexpensive, hands-on, investigative classroom activities. These activities allow two-year college and secondary schools with limited budgets to provide future technicians and scientists with an excellent scientific background in the techniques and concepts of biotechnology. Additionally, strong articulation between two-year and high school programs and industry are being established to ensure that students pursuing careers in biotechnology have the ability to enter the industrial or research work environment, as more than competent technicians, or to pursue higher degrees at four-year institutions. These activities seek to involve all students in

DRAFT

learning biotechnology, including women, minorities, and persons with disabilities. Emphasis is being placed on the role of biotechnology in the future of the human environment and medicine and the effect of biotechnology on preservation of plant species and enrichment of agriculture.

Activities from this workshop are being refined, reviewed for scientific accuracy and pedagogy, and field-tested nationwide. Field test and review panel input are being used to modify the activities for compilation into a monograph for nationwide distribution. Project results are being disseminated through training and in-service workshops at national, state, regional, and local levels.

Title: Advanced Technology Curriculum: Meeting AEA Standards

Andrew Woodson
North Seattle Community College
Seattle, WA 98103-3599

DUE 9553726
FY1995 \$300,000
FY1996 \$300,000
Advanced Technological Education

The aim of the project is to enhance pre-vocational and electronics and engineering technologies curricula. By collaborating with industry, professional associations, institutions of higher education, and secondary schools, the project is developing model programs that raise standards and performance levels for technicians in industrial applications. To comply with the new standards developed for technicians by the (AEA) designed to raise skill and knowledge levels, the project is effecting significant changes in the approach to technological education. Spanning a period of two years, the project focuses on three major components:

(1) **Faculty Development**, A faculty enhancement program is planned to prepare faculty for curricular reform. Participants in a summer institutes include electronics and engineering faculty, secondary school teachers, and representatives of industry. The Institutes cover a range of topics that include AEA standards, industry practices, collaborative approaches to teaching, use of interactive courseware, and competency-based instruction.

(2) **Curriculum and Institution Materials**. Comprehensive curricular reform includes development of pre-college level workshops in communications, computers, developmental technical mathematics and algebra for students deficient in basic skills, applied academics, integration of science and mathematics into technical programs, and new and revised curricula in electronics and engineering technology. Modules focus on basic skills and on specific, typically complex technical topics such as object-oriented design and documentation.

(3) **Laboratory Improvement**. Over the two-year period, faculty are integrating into the curriculum a new learning laboratory where automated work environments can be simulated and state-of-the-art systems demonstrated. The integrated systems laboratory is designed to provide students with an overview of systems involved in taking a product from design and pattern layout to a tested and finished product.

Title: College/Industry Telecommunications Education Partnership

Charles W. Merideth
NYC Technical College
Brooklyn, NY 11201

Proposal: DUE-9553738
FY1995 \$156,000
Advanced Technological Education

New York Technical College/CUNY and NYNEX are collaborating to develop a telecommunications technology program that provides NYNEX employees the underpinnings in telecommunications fields while also acting as a prototype two-year degree program for all students. This initiative emerged from a shared vision that the development of an adaptive, technologically-agile, and customer-focused workforce is crucial to the development of NYNEX, now and into the next century. The mission of the project is for the two-year college to provide an innovative, telecommunications program that enables employees to stay apace with advancing technology, to understand changing marketplace realities, and to develop customer service skills. This is done by working closely with industry to identify

DRAFT

the workforce skills that is being needed five years in advance and then creating an Associates' Degree program to deliver an educated, customer-accountable workforce that is committed to the value of life-long learning. The project includes a faculty enhancement component.

Title: The South Carolina Advanced Technological Education (SC ATE) Exemplary Faculty Project

Lynn Mack
Piedmont Tech College
Greenwood, SC 29646

DUE 9553740
FY1995 \$ 486,930
FY1996 \$ 487,297
FY1997 \$ 482,379
Advanced Technological Education

The South Carolina Advanced Technological Education (SC ATE) Exemplary Faculty project is designed to restructure the learning environment to prepare two-year technical college students for the workplace. The project is creating a cadre of exemplary faculty teams for the express purpose of implementing innovative research-based advanced technological education practices across the SC Technical College System. The major objectives are to: (1) Develop and implement a comprehensive Faculty Development Program for ATE that addresses faculty development needs in advanced technology education content, effective pedagogy, and assessment of student learning outcomes; (2) Develop, pilot test, implement research-based curricular reform in advanced engineering technology programs; and (3) Evaluate implementation processes and materials and disseminate successful processes and products at the local, state, and national levels. Methods include involving interdisciplinary faculty teams from the sixteen SC technical colleges in intensive professional development activities. The primary audience is mathematics, physical science, engineering technology and communications faculty members. Collaborative partners include Clemson University and the National Dropout Prevention Center at Clemson, the SC State Department of Education (SSI and Tech Prep Programs) SC ETV, the Academy for Educational Development, and the Virginia Community College System.

Title: Digital Imaging Laboratory Development Program

Bobby Hoyle
Texas Technical Institute, Harlingen
Harlingen, TX 78550

Proposal: DUE 9553741
FY1995 \$ 100,000
Advanced Technological Education

Texas State Technical College at Harlingen is developing a Digital Imaging Technology Program to improve specialized skills and training to students in the field of digital imaging technology. A digital imaging curriculum is being developed and a digital imaging laboratory/studio created to facilitate the use of non-traditional learning approaches that encourage interactive learning, team building, creative problems solving among students and teachers. There is an extensive collaborative efforts involving eight secondary schools, the Tech Prep/School to Work Initiative, and regional, state, and national industries. The main population to be served includes students in the Rio Grande Valley of Texas -- a predominately Hispanic populated area.

Title: Development of a Two-year Associate Degree in Agricultural Technology

Terry Brase
Hawkeye Community College
Waterloo, IA 50704

DUE 9553751
FY1995 \$ 200,000
Advanced Technological Education

Hawkeye Community College is developing and distributing the curriculum for an associate degree in Agricultural Technology. In the past two years rapid changes have occurred in technology in the field of food systems. Technology changes involving biotechnology, chemical usage, GPS/GIS satellites, and computer/telecommunication networks will continue into the next century. For farmers to remain competitive in the

DRAFT

food industry, they and the food systems sales and service people supporting them, must be educated in this new technology. "There is being fewer and larger farm operations, still individually owned and operated by families, but more businesslike...And to be profitable, the farmer is have to use technology" (KSU AG REPORT, Fall 1994). Hawkeye Community College is planning and testing an innovative 63 credit hour curriculum which links the agricultural and business experience with technology. The curriculum and all support materials are being used in expanding articulation agreements with the secondary schools and four-year institutions including a land grant university interested in updating agricultural curriculum into food systems. The materials are being disseminated through national education associations, journals, and telecommunication systems.

Title: A National Two-Year Associate Degree Program in Environmental Technology

Stephen E. Swanson
Kansas State University-Salina
Salina, KS 67401

DUE 9553753
FY1995 \$75,000
Advanced Technological Education

Kansas State University-Salina and a consortium of ten community colleges are developing a plan for a student-centered environmental technology curriculum suitable for national distribution. The utility of the project is to provide building blocks to allow for individual course development at the community colleges that adapt the curriculum. This enables the end users to customize their own particular curriculum. The team assembled is composed of content, pedagogy and media specialists. A satellite and Internet based communications network is being established to enable instructors nationwide to keep in contact with each other and with content specialists, and to provide access to maintained databases for curriculum updates.

Title: Teacher/Faculty Enhancement, Curriculum Development and Laboratory Improvement for Fiber Optics Technology Education

Nicholas M. Massa
New England Board of Higher Education
Boston, Massachusetts 02111

DUE 9553762
FY1995 \$ 365,100
Advanced Technological Education

This project is a faculty development activity which aims to provide training for college faculty and pre-college faculty members. A series of two-day workshops, summer workshops, and technical assistance sessions are being conducted over a period of 30 months. The project is designed to increase the number of high school teachers and two-year college faculty who have the expertise to include fiber optics and related topics in their science/technology programs. Also, the project includes faculty enhancement, curriculum development, and laboratory improvement. There is a significant participation from industry.

Title: Development and Implementation of Advanced Applied Technological Mathematics

Alfred Patrick
SUNY Adirondack Community College
Glens Falls, NY 12801

DUE 9553765
FY1995 \$ 184,880
FY1997 \$ 49,314
Advanced Technological Education

This three-year project involves a community college, four area high schools, and local business and industry in developing and piloting an advanced mathematics course as a fourth year offering to follow and extend a Tech Prep applied mathematics sequence. This course is consistent with the New York State Framework and national guidelines from the National Council of Teachers of Mathematics and the American Mathematical Association of Two-Year Colleges. Specific attention is being devoted to student problem solving, critical thinking skills, concept attainment, motivation, and making connections in applied laboratory hands-on settings. The embedded use of calculators and

DRAFT

computers is being a major goal of this effort. The course materials are being disseminated in the Capitol Region Consortium and beyond. A publisher is anticipated for this course product.

Title: Defining the Emerging Role of the Technologist in a Computer-Aided-Engineering Environment

Robert W. Simoneau
Keene State College
Keene, NH 03435-0001

DUE 9553767
FY1995 \$250,000
FY1996 \$150,000
FY1997 \$148,260

Advanced Technological Education

The Industrial Technology and Safety Program at Keene State College project is planning and implementing a revised curricula in its two-year associate degree program in Design and Manufacturing based on the emerging Computer Aided Engineering environment. Today graduates are entering an increasingly competitive job market. They need to have readily marketable skill in order to compete for jobs or the academic proficiency to go on to obtain advanced degrees. The companies that hire graduates are facing enormous competitive pressure from around the world. The loss of our manufacturing base continues and the resulting job loss is a significant social-economic and political problem. United State's companies need a flexible and technologically competent workforce in order to stem this tide. The emerging role of the technologist must be one that can fully utilize computer assisted technology. This computer environment is integrating the once discrete job functions of design, manufacturing, and business. The current limitations in existing discrete curricula suggests a new "seamless" educational paradigm. To address this situation three areas of study. The first is a conceptual based curriculum, using a projects focus, to deliver technical problem solving for meeting curriculum goals. The second aspect is to create a series of four integrated courses in the area of product design and development, utilizing a computer assisted environment. The third is to establish a collaborative working on these projects on the Internet, with other schools, government laboratories, and companies. The curriculum model the project is creating is an immersion model for students that provides both a contextual and constructivist environment for problem solving. In this environment students solve holistic and fully integrative problems in math, science, technology, and business. This curriculum model emulates both the emerging computer assisted environment and the world of work. The goals are to create this new curriculum paradigm and study its effectiveness. The model is both pragmatic and realistic and serves as a nation model. This is one of many solutions being offered to help improve the competitive position of graduates. By breaking with traditional paradigms the project serves as a model to entice non-tradition, and minority students, as well as displaced workers to move into the exciting and challenging world of product design and development. The project also opens many new and exciting opportunity for educational research.

Title: Advanced Technological Education Project in Environmental Technology

Jeffrey Cramer
Stark Technical College
Canton, OH 44720

DUE 9553768
FY1995 \$516,209

Advanced Technological Education

Stark Technical College (STC) is developing an Advanced Technological Education project in Environmental Technology which is resulting in the development of an Environmental Technology option within Civil Engineering Technology. The project is addressing northeastern Ohio's business and industry needs for technical expertise in *environmental instrumentation, regulation and compliance* areas as well as *waste minimization/pollution prevention* concepts. This need is critical due to the heavy concentration of manufacturing in the region and the fact that northeastern Ohio is the most polluted quadrant of the state. The College's established ties with business and industry in the region are facilitating the design of a program that is producing uniquely qualified graduates who help the public and private sectors address growing environmental regulations and concerns. The AAS degree curriculum is tied into secondary Tech Prep programs in the region and related bachelor's degree programs at Youngstown State University and the University of Findlay. An integral part of the curriculum is advanced communications technologies which enable students (high school, two-year college and university) to communicate with each other on collaborative projects. It also serves as the basis for an Environmental Resource Center (ERC), to

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be operated by students, which facilitates and enhances instruction, as well as responds to business/industry and community questions and concerns. A major component of the project summer institutes and academic year follow-ups for teacher/faculty enhancement in several key areas: pedagogy; technical expertise; and math, science and communications-related instruction.

Title: Mathematics for Technology - Laboratory Investigators

Gary M. Simundza
Wentworth Institute of Technology
Boston, MA 02115-5998

DUE 9455996
FY1995-\$46,804
Mathematics

Mathematics faculty at Wentworth have been employing active learning strategies characteristic of the calculus reform movement at all levels of mathematics courses for students of engineering technology since 1989. This student population is motivated primarily by perceived relevance of subject matter to specific technical problems. They are developing, through joint efforts of mathematics and technical faculty, laboratory investigations using engineering laboratories and multi-media simulations which illustrate and teach mathematical concepts. This planning project begins at the intermediate algebra/trigonometry level and continues through differential equations, and includes the finite mathematics/statistics track for manufacturing students. 100 sections per year, containing 2500 students, will be affected. Through the Southeast Massachusetts TECH PREP Consortium, Wentworth is taking the lead in extending the secondary level "integrated curriculum" reforms of Tech Prep to the college level. Tech Prep consists of alliances of secondary and post secondary schools in a (2+2) format for technical education. The Wentworth project is serving as a national model for colleges of engineering technology in integrating the learning of mathematics with technical applications.

Title: Integrating Computer Software into Lower Division Engineering Technology Courses

William D. Lauffer
Prince George's Community College
Largo, MD 20772-2199

DUE 9455105
FY1995 \$39,269
Engineering Technology

Prince George's Community College, Largo, MD (PGCC) will hold a five-day workshop in summer 1995, Integrating Computer Software into Lower Division Engineering and Engineering Technology Courses. The workshop will be for 20 faculty from engineering, engineering technology, and science, who teach lower division courses in community colleges and senior institutions in the middle Atlantic states. The workshop will include lecture/demonstration, visualization activities, and computer work with Math CAD, MicroCAP, LogicWorks, and PADS. Each participant will bring three problems from three different courses to the workshop. These will be solved during the workshop and developed into a "book" of practice problems and solutions which will be given each participant. Applications will be shown to Statics, Dynamics, Strength of Materials, Thermodynamics, Electronics, and Physics Courses. Workshop participants will also be introduced to Internet and its uses and to the work of the NSF Engineering Coalition, Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL). Follow-up activities include the development by PGCC of a computer bulletin board to allow workshop faculty and other faculty in their home institutions to communicate and assist one another, presentations by workshop participants in their home institutions, and presentations and papers for professional meetings.

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1994 Project Awards Continuing into 1995

Title: Math/Science Enhanced Manufacturing Technology Training for Females and Minorities

James Amara
Minuteman Vocational Technical School
Lexington, MA

DUE 9453921
FY1994 \$ 185,700
FY1996(TE) \$ 170,370
Advanced Technological Education

A pilot manufacturing laboratory facility has been established at Minuteman Science and Technology Secondary School. This formal three year curriculum in manufacturing technology is being developed in coordination with Middlesex Community College.

This project is developing over a four year period an integrated manufacturing Institution model for 30 female and minority grades 6-12 teachers. Participants are being introduced to the project via three seminars held in the spring. Seminars are on equity issues and manufacturing technology. Each summer over the life of the project the participants receive an intensive three week workshop on current trends and practices in manufacturing. Topics include: automation, electronics, mechanics, and bio-manufacturing. Emphasis is placed upon the integration of mathematics and science, the importance of communication and human relations, technology skills related to manufacturing, career awareness, and hands-on activities appropriate for junior and senior secondary-school students. Each academic year the original thirty teachers acquire more complex integrated mathematics/science and technology skills coupled with specific workshops on women and minority issues as they begin to develop integrated projects suited to their teaching environment. The project emphasizes a realistic view of science and technology as problem solving activities which requires skill in collaboration, experimentation, writing, computing, and the pursuit of exploration.

Title: Expanding the Biotechnology Education Program in the San Francisco / Oakland Bay Area

David R. Stronck
California State University Foundation
Hayward, CA 94542

DUE 9454502
FY1994 \$ 250,000
Advanced Technological Education

A program for training biotechnology technicians is presently operating at Contra Costa Community College with articulation to Richmond Secondary School. A Tech-Prep grant funded internships at Contra Costa College and local biotechnology firms for secondary school students. This project is assisting science educators and scientists to continue preparing technicians for local biotechnology companies. A three week workshop for 48 teachers and 8 meetings during the academic year are being offered. Mentors make site visits, and telecommunications is being used to implement the program. A biotechnology kit and curriculum are being developed and implementation is planned into many secondary schools with high minority enrollments.

Title: Interactive Multimedia Instruction for Advanced Instrumentation Technology

Kenneth Sweeney
Alvin Community College
Alvin, TX 77511

DUE 9454508
FY1994 \$ 247,823
Advanced Technological Education

Interactive multimedia Instruction (IMI) is known to be an effective method of delivering technical skill instructional to learners across many educational areas. This project merges the Instrument Society of America's INVOLVE IMI system with the current Electronics program to provide a specialized Associate of Applied Science Instrumentation curriculum. The principal aims of the project are to increase the number of Instrumentation career

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seekers, to build education pathways from secondary schools through four-year and higher education in partnership with industry, and to educate a more culturally-diverse and gender-balanced work force and improve learning efficiency. The project is producing highly skilled individuals able to track the process control industry's transition into the evolving automated workplace of tomorrow.

Title: The Pacific Technological Education Project - PacTEC

Wade Ellis
West Valley College
Sarasota, CA 95070

DUE 9454513
FY1994 \$ 300,000
Advanced Technological Education

Pac-TEC is a consortium of two-year colleges, secondary schools, and businesses situated in the Silicon Valley with regional partnerships in seven western states. This project is developing and distributing state-of-the-art instructional materials and techniques to secondary schools, colleges, industry, and government. These materials focus on innovative mathematics, science, engineering, and technology and are aimed at students who is becoming technicians. Emphasis is being placed on the development of materials which enhance students' problem solving abilities, computer literacy, effective oral and written communication skills, and ability to work in groups. The materials are being created around open-ended design based project work.

Title: Partnership for the Advancement of Chemical Technology - PACT

Arlyne M. Sarquis
Miami University Middletown
Middletown, OH 45052

DUE 9454518
FY1994 \$ 400,000
FY1995 \$ 400,000
FY1996 \$ 400,000
Advanced Technological Education

Miami University Middletown, in partnership with the major chemical industries in Ohio and a regional consortium of two-year and four-year colleges and secondary schools, is establishing a regional consortium for Chemical Technology Education. By bringing academic courses into closer touch with today's industrial chemistry, the project is attracting additional students to careers in chemistry and improving the quality of education of chemical technicians.

Four categories of activities are envisioned for the project: 1) Curriculum Development; 2) Instructional Materials Development; 3) Faculty and Teacher Enhancement; and 4) Student Enhancement and Outreach. Secondary school and college faculty are eligible for a Teacher Industrial Internship Program in which participants spend a summer or part of an academic year working in partner industries. Similarly, master secondary school teachers and two-year college faculty are working in collaboration with industrial chemists in developing curriculum and Instructional materials. Symposia and special topic seminars are also being organized on a regular basis.

The project is being built upon the nationally known eight-year old Partners for Terrific Science industrial/academic partnership and programs housed in the Center for Chemical Education at Miami University Middletown, as well as existing collaborative efforts of the consortium members. This project is serving as a model for regional and national development of improved chemical technician education.

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Title: Image Processing for Teaching: Faculty Development and Curriculum Materials

Melanie Magisos
Center for Image Processing in Education
Tucson, AZ 85712

DUE 9454520
FY1994 \$403,814
FY1995 \$466,493
FY1996 \$476,524
Advanced Technological Education

Image Processing for Teaching (IPT) brings a powerful technology to schools and two-year colleges where students use this state-of-the-art tool for exploration and analysis, learning problem-solving skills, computer and imaging technologies, and specific image processing skills which are becoming increasingly important in the modern workplace. IPT's past success at exciting students about science and mathematics, bringing inquiry and discovery-based learning to students of all ability levels, has created considerable demand for implementation in vocational/technological education settings.

The IPT project is producing curriculum materials targeting technological education programs. Workshops are being designed and conducted to provide the faculty development necessary for successful implementation. IPT further supports implementation with follow-up services, including toll-free telephone and e-mail communication, an annual conference, and periodic video conferences. The team of expert teachers play a primary role in all planning, development, and instructional activities. The stream of interdisciplinary activities, keyed to occupational clusters, keeps instructors and their students on the cutting edge of technology, while using a demonstrated powerful tool for learning.

Title: Preserving the Legacy: A Comprehensive Curriculum and Materials Development Project in Support of Advanced Environmental Technology Education

Sally V. Beaty
Intelcom Intelligent Telecommunications
Pasadena, CA 91105-1937

DUE 9454521
FY1994 \$ 499,988
FY1995 \$ 499,989
FY1996 \$ 499,989
Advanced Technological Education

This project is developing instructional materials including print and video, laboratory materials, and faculty guides to be used in the education of environmental technicians. The project is being carried out in cooperation with the Partnership for Environmental Technology Education (PETE) and Van Nostrand Reinhold Publishers. The material to be generated covers eight content areas: (1) Introduction to Environmental Technology; (2) Waste Generation, Reduction, Treatment, and Prevention; (3) Basics of Toxicology; (4) Basics of Industrial Hygiene; (5) Site Characterization, Sampling, and Field Analysis; (6) Environmental and Hazardous Materials Regulations; (7) Contingency Planning and Reporting for Emergency Response; and (8) Safety and Emergency Response.

The primary audiences for the modules are two-year community and technical college students throughout the United States. Linkages are being established, however, which make *Preserving The Legacy* accessible to secondary school students, as well as students attending four-year colleges and universities.

Title: Establishment of an Instrumentation Calibration Laboratory

Ron Ingle
Piedmont Technical College
Greenwood, SC 29646

DUE 9454536
FY1994 \$123,904
Advanced Technological Education

This project is creating an instrumentation calibration curriculum strand for engineering technology, technician and science students. The curriculum focuses on a dedicated laboratory consisting of three independent but integratable

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modules providing hands-on experience with equipment measuring: (1) voltage, current, resistance, and power; (2) fluid flow, and (3) pressure, temperature, and volume. The resultant curriculum consists of ten modified or new courses affecting 16 engineering technology and science faculty and is being offered to students in seven different majors, and is affecting both directly and indirectly, area secondary school students and two-year college students statewide. It is producing a replicable model for how two-year colleges can adequately produce the type of broadly-educated technician needed to lead in instrumentation calibration design and operation in high-performance industries.

Title: A Partnership for Excellence in Engineering Technology Education

Wayne R. Hager
Pennsylvania State / University Park
University Park, PA 16801

DUE 9454547
FY1994 \$ 282,000
FY1995 \$ 376,000
Advanced Technological Education

This project represents a partnership between the York County Area Vocational-Technical School, the York City Schools, Penn State University (at its York, Harrisburg and University Park two-year campuses), regional industry and the Pennsylvania Department of Education. The partnership is developing a comprehensive model for technological education for 11th grade through the associate degree level with possible extension to the baccalaureate level. The model focuses on manufacturing curriculum and educational processes. It is producing integrated and interdisciplinary modules, teaching materials, and resources for seven courses.

The modules are being developed collaboratively by teachers and faculty. The modules, which focus on technical topics, are being developed within the context of teacher/faculty workshops which include enhanced pedagogical techniques. Use of the modules is reinforcing technical topics within the secondary school curriculum and bringing enhanced teaching techniques to the college curriculum. All educational levels see better integration of topics and understanding of the interdependence of mathematics, science, and technology.

The project anticipates substantial dissemination to secondary and postsecondary faculty at other Penn State locations, and to faculty across the state and nation. The project plan capitalizes on and integrates a variety of current efforts to coordinate technological education in the state and region.

Title: Establishing New Technology Education and Rural Area Networks

Chandler H. Stevens
Minnesota Riverland Technical College (Austin Campus)
Austin, MN 55912

DUE 9454551
FY1994 \$271,802
FY1995 \$228,198
Advanced Technological Education

A two-year project in curriculum and network development undertaken by two two-year colleges (Minnesota Riverland Technical College and Austin Community College) also involves universities and secondary schools; initially Mankato State University and Austin Secondary School. This project focuses on educating builders of information highways and local byways. The focus is on "conets" -- cooperative networks that link communities and companies regionally as well as within evolving national and global information infrastructures.

The last two years of secondary school and last two years of university baccalaureate degrees (in engineering, information science, etc.) provide a "2+2+2" context for developing a two-year associate degree in interactive mass media and networking communications. Students study core, general, and technical courses and then select options -- tentatively called digicom (electronics), multiware (computers), and intervision (mass media). Practicums entail student work on development of a "conet" to serve local communities and involve secondary schools as public access sites, equipped with terminals and kiosks.

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This two-year project is intended to help set the stage for development of both: 1) CoNet supporting curricula not just within two-year colleges but within "2+2+2" education extensions; and 2) a Southeastern Minnesota CoNet regional community network, as a potential model for rural regions in the United States and globally.

Title: An Advanced Biotechnology Education Partnership Program

Joy A. McMillan
Madison Area Technical College
Madison, WI 53703

DUE 9454555
FY1994 \$ 400,000
FY1995 \$ 400,000
FY1996 \$ 200,000

Advanced Technological Education

The goal of the proposed project is to provide skilled employees for the biotechnology industry. To achieve this goal, a collaboration is being established between the Biotechnology Laboratory Technician Program at Madison Area Technical College, the University of Wisconsin Teacher Enhancement Program, and the industry-based BioPharmaceutical Technology Center Institute. This project is a well-coordinated, highly integrated effort to: (1) develop and disseminate curriculum materials specifically designed for technician training at the two-year associate degree level; (2) provide teacher enhancement activities in biotechnology including summer institutes, mentoring and curriculum development partnerships for associate degree and secondary level school teachers; and, (3) support the development and coordination of industry-led, statewide programs to offer work-based experiences for secondary school students. The program links together the development of instructional materials with faculty enhancement, student laboratory experiences, and school-to-work initiatives

Title: Science Technology: Knowledge and Skills

David K. Lavalley
American Chemical Society (ACS)
Washington, DC 20036

DUE 9454564
FY1994 \$ 500,000
FY1995 \$ 500,000
FY1996 \$ 500,000

Advanced Technological Education

The Science Technology: Knowledge and Skills curriculum project, (SciTeKS), fills the void of science-oriented technical courses in Tech Prep and similar school-to-work transition secondary school programs. The project is designed to develop printed and multimedia student and teacher materials for large context modules involving chemistry, biology, and earth/space sciences. The development includes curriculum design recommendations and models, multimedia instructional and reference materials for students, suggestions and models for implementation, support for teachers, and guidance for assessment. The curriculum is designed to develop in secondary school students skills in teamwork, problem solving, communication, and other capabilities considered critical for their success in the workplace and/or in further education. The SciTeKS project provides a two-year science curriculum for a variety of school-to-work programs. Students completing SciTeks are ideally prepared to enter immediate employment or college technician programs based on biology, chemistry, or earth/space sciences. The pedagogical strategies are being developed by a team of secondary school, college, and industrial participants.

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Title: A Consortium for the Development of Advanced Manufacturing Education

Bartlett M. Sheinberg
Houston Community College
Houston, TX 77270

DUE 9454569
FY1994 \$ 304,000
FY1995 \$ 300,000
Advanced Technological Education

The primary purpose of this project is to create a model technology educational program beginning with a selected discipline and adapting it to other engineering technologies. The project is creating a model of collaboration between secondary schools, two-year and four-year colleges, educational and work force agencies, professional organizations, and private industry.

This project involves an informal consortium between Houston's Spring Branch Independent School District, the Northwest College of the Houston Community College System, the College of Technology of the University of Houston, and selected private industry partners.

The project encompasses: 1) a needs assessment of industrial educational and training requirements, 2) curriculum development at the secondary, community college, and four-year college levels; 3) faculty / student development through educational and industry mentor / apprenticeship opportunities, and 4) and evaluation of project performance.

Title: Hands On Physics: A New Conception of Physics

Robert Tinker
Concord Consortium
Concord, MA 01742

DUE 9454575
FY1994 \$ 432,743
Advanced Technological Education

Hands-On Physics represents a major reconsideration of introductory physics which takes full advantage of the powerful insights learned about how students learn and the new opportunities technologies offer. The material targets students headed for technological careers at the secondary school and two-year college level. The project is a collaboration between a small central staff and practicing teachers and faculty who are developing, testing, and revising the material in actual classrooms. The Concord Consortium is a collaboration between TERC, MIT (Massachusetts Institute of Technology), and several community colleges in Massachusetts.

Title: A Model Rural Appalachian Partnership to Improve Technology Education through Faculty Enhancement and Curriculum Development Activities

Gary T. Laing
Wytheville Community College
Wytheville, VA 24382

DUE 9454577
FY1994 \$ 197,873
Advanced Technological Education

This project is designed to significantly improve the quality of technological education in Southwest Virginia by increasing the capability of five community colleges to respond to industry-identified needs for advanced manufacturing technology (AMT) education. The project activities serve as a model for rural Appalachian colleges and are coordinated through the Southwest Virginia Advanced Manufacturing Center, formed through the consortium of five community colleges. The project involves two components: 1) enhancement of faculty skills and knowledge to teach the advanced technologies required by AMT curricular courses via "back-to-practice" internships in industry and attendance at seminars and workshops, and 2) initial development of common AMT curricular courses by cross-disciplinary teams, comprised of faculty from the five participating community colleges, representatives from regional business and industry, and faculty from area secondary schools and four-year Institutions.

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Title: Kentucky Advanced Technological Education Education Project

Anthony Newberry
University of Kentucky Research Foundation
Lexington, KY 40506

DUE 9454585
FY 1994 ATE \$ 696,300
FY 1994 ILI \$ 103,700
Advanced Technological Education

The Kentucky Community College System is establishing computer facilities at each of its fifteen widely separated community college campuses. These new facilities are being utilized for statewide reform of the mathematics algebra-level and calculus which form part of the curriculum for students in Advanced Technological Education programs. The laboratories also support development of new two-year curricula in telecommunications and computer system management. A system of formal courses (taught using satellite facilities) to train faculty and staff to maintain the network system are catalyzing Continuing Education/Community Service programs in the use and administration of network systems. Colleges are also developing the capability to offer a new associate degree program in network system administration. At the conclusion of this project approximately 40% of the System's intermediate and college algebra level mathematics courses will be taught as integrated courses in a collaborative learning environment using technology as a learning tool. While 15,000 students across Kentucky are directly benefiting from the revised curriculum during the actual project period, the project will ultimately affect many thousands more students and ordinary citizens.

Title: Advanced Technological Education Programs in Semiconductor Manufacturing

David Hata
Portland Community College
Portland, OR 97219

DUE 9454589
FY1994 \$ 100,000
FY1995 \$ 100,000
Advanced Technological Education

The Portland Community College - Intel Corporation cooperative program in semiconductor manufacturing education is being transported to two other sites: The Southwestern Indian Polytechnic Institute and Albuquerque TVI with Intel and Chemeketa Community College in Oregon with Siltec Silicon. This academic program is characterized by a solid foundation of science, mathematics, and communications skills, along with specialty courses offered using industry facilities. Project activities include curriculum transfer, faculty development, course implementation and updating, instructional delivery, program assessment, and dissemination of project results. A central feature of the project is an annual three-day workshop at which faculty participants collaborate on how courses should be taught, course content and level, student assessment, and specification of best practices identified at the various sites.

Title: Integrating Technical Applications into the Learning of Mathematics: A Collaborative Effort

Reginald K. Luke
Middlesex County College
Edison, NJ 08818

DUE 9454604
FY1994 \$ 169,813
Advanced Technological Education

This project involves an interdisciplinary development of technical mathematics instructional modules, emphasizing the problem-solving approach; the scientific method; and realistic, real-world problems. Representatives from business and industry, in particular, those from the Princeton Plasma Physics Laboratory, are providing technical and industrial perspectives on scientific and engineering applications. The graphing calculator linked with a portable sensor and probe setup, called the Calculator Based Laboratory (CBL) system, are the technological instructional Institution tools chosen for classroom and laboratory use. Over a two year span a total of 10 curriculum teams, comprised of Middlesex County College mathematics and science/engineering faculty, working cooperatively with teachers from local secondary schools, are producing 30 instructional modules, to be used at the secondary school

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level as well as in technical college curricula. A series of conferences and workshops are being held to assist participants in mastery of these technological tools, as well as the most effective problem-solving and cooperative-learning strategies. The instructional modules are being disseminated through the Middlesex County College network of local secondary schools, a consortium of regional community colleges, the New Jersey Statewide Systemic Initiative for Improvement of Mathematics and Science, and professional mathematics associations.

Title: Technology Instruction for the 21st Century

Bernard E. Mohr
CUNY Queensborough Community College
New York, NY 11364

DUE 9454613
FY1994 \$197,013
FY1995 \$205,300
FY1996 \$110,652

Advanced Technological Education

Multimedia-based curriculum materials are being developed to support technology education in data acquisition, embedded systems, and multimedia and high speed networks. These materials, which include networked laboratory manuals, text and student exercises, are available in a modular format to facilitate their incorporation into technology education courses at other institutions. A significant evaluation component is included to assess the effectiveness of the multimedia materials, especially with respect to learning outcomes for members of underrepresented groups. Six one-week summer workshops (two each year over a three-year period) are being offered to disseminate products completed in the project and to assist faculty to develop the capability to author effective multimedia-based materials.

Title: Two-Year Associate of Technology Curriculum Development for GIS/GPS Technologies

James L. Keating
Kansas State University at Salina
Manhattan, KS 66506

DUE 9454618
FY1994 \$ 500,000

Advanced Technological Education

This project is to developing and distributing a curriculum for an associate degree in the fields of Geographical Information Systems (GIS) and Global Positioning Systems (GPS). The projected need for trained GIS and GPS technicians is high because, within the next decade, every plane, ship and almost every vehicle on the highway will use GIS and GPS; and governments will rely on these technologies to track, tabulate, and map environmental census and tax data.

In cooperation with a network of eight community colleges, an innovative curriculum is being planned and tested, which links the environmental, legal, and business experience of the partner colleges with the lead institution's experience in GIS/GPS and engineering technology. The curriculum, and all support materials, are being used as a vehicle to ease articulation between other schools (secondary, two-year and four-year) that are interested in adding GIS/GPS to their curricula. The materials are also being disseminated through national publishers, journals, and a national educational association.

Title: A Revision of Technical Physics

Robert W. Eshelman
Henry Ford Community College
Dearborn, MI 48128

DUE 9454620
FY1994 \$ 129,670

Advanced Technological Education

Henry Ford Community College (HFCC) is revising the curriculum of its introductory Technical Physics course, a class required for students in career education programs such as electrical / electronics technology, energy

technology, industrial drafting, manufacturing engineering, and robotics. With approximately 200 students enrolled in Technical Physics each year, the College has a significant population for its study.

The revised course incorporates Workshop Physics, technological applications, and Writing Across the Curriculum, and in the process is being aligned with the National Science Education Standards. Working closely with a steering committee comprised of industry representatives and faculty from other colleges, the HFCC project team is determining current technological applications which require the physics which is included in the introductory course. Industry is also contributing to the design of the writing component of the technical physics course, providing samples of technical reports appropriate in the industrial context.

Title: The Application-based, Technology-Supported, One-Track Mathematics Curriculum Program (ATO)

Pamela E. Matthews
Mount Hood Community College
Gresham, OR 97030

DUE 9454627
FY1994 \$469,923
Advanced Technological Education

The Mt. Hood Community College (MHCC) Mathematics Division is developing, implementing and disseminating a comprehensive Application-based, Technology supported, One-track Mathematics Curriculum for all students (baccalaureate preparation and technical preparation). The four levels of study incorporate the National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards and the Secretary's Commission on Achieving Necessary Skills (SCANS) recommendations. The curriculum development responds to the education reform movement in mathematics while addressing: the lack of appropriate course materials targeting community college students; the lack of a framework to train adjunct mathematics instructors (on which the community college heavily relies); and, the lack of articulated curriculum for the same level of mathematics taught in middle schools, secondary schools, community colleges and four-year schools.

The following are the three objectives for development and implementation of the Applications, Technology, One-Track (ATO) Program: (1) to develop and publish course materials for Levels II and III (applications oriented algebra) of ATO: a textbook for each level that fully integrates the use of technology; and, a hands-on activities and real-world interdisciplinary applications supplement; (2) to develop a framework for the ongoing staff development of community college adjunct mathematics faculty to enable them to effectively deliver a coherent mathematics curriculum; (3) to develop in collaboration with middle schools and secondary schools in the community college district an articulated coherent mathematics curriculum that addresses content-based proficiency assessment strategies, and supports uniform implementation of the NCTM Standards in mathematics education.

Methods to accomplish these objectives build on previously-established team efforts at MHCC, partnerships with industry, and collaborative activities with other schools including middle schools, secondary schools, and four-year colleges. The Northwest Regional Educational Laboratory is instrumental in the evaluation of the project, along with the Program Management Evaluation/Assessment Advisory Team.

Title: Environmental Technology Education for Native American Tribal Colleges

Karl F. Topper
Mesa State College
Grand Junction, CO 81502

DUE 9454633
FY1994 \$ 399,778
Advanced Technological Education

Native American Tribal environments have often historically been neglected; and tribes have inadequate resources and expertise to deal with cleanup and prevention of further pollution. Because tribes need to know how to measure and analyze their own environmental risks, a technologically educated and trained Native American environmental work force is needed.

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This project is using existing resources to create and transfer an interdisciplinary environmental technology associate degree curriculum for tribal colleges and other community colleges with roles in educating American Indians. It is also providing faculty enhancement, institution materials, and a rotating equipment program. The curriculum focuses on those technologies used for environmental monitoring, site assessment, solid waste management, and pollution prevention because these are the prominent environmental issues facing tribal lands. From incorporation of support disciplines, (mathematics, science, communications), students are developing analytical skills for situations in which they are not specifically trained. Mesa State College and Navajo Community College are the resource colleges, each with different established environmental technology programs. The pilot group of tribal and tribally related colleges are Navajo Community College, Northern New Mexico Community College, Crownpoint Institute of Technology, and Southwest Indian Polytechnic Institute. The project methodology is interactive, using workshops, site visits, iterative writing/review, and hands-on activities. The tribal colleges are part of the process from the beginning and will take ownership of the curriculum.

Title: Advanced Biotechnology Education Project

Barry L. Werner
Middlesex Community College
Bedford, MA 01730

DUE 9454642
FY1994 \$ 347,978
FY1995 \$ 392,307
FY1996 \$ 392,109

Advanced Technological Education

This project is developing coordinated secondary school and two-year college biotechnology curricula. Supporting activities include teacher and faculty training, industry mentor education, program materials development, job shadowing, and the recruitment and retention of underrepresented groups of students. Principal collaborators include a two-year college, secondary schools, four-year colleges and universities, biotechnological industries and government. Biotechnology programs are being articulated for different educational levels, and major developments include classroom and multimedia materials. Also, developed materials are being disseminated through various media such as publications, videos, electronic linkages, workshops, and conferences.

Title: Establishing and Transporting: Science, Computer and Electronics Technology to Rural Minority Students through Simulated Laboratories and Telecourses

G. Robert Converse
University of Hawaii / Maui Community College
Honolulu, HI 96822

DUE 9454647
FY1994 \$499,938

Advanced Technological Education

Maui Community College is establishing and transporting a distance education project that involves teaching science, computer, and electronics technology curricula to rural minority students through interactive teleclass lectures and simulated multimedia laboratory experiences. The first stage of the project encompasses the development of multimedia institution materials for a model Certificate and Associate in Science Degree curriculum in Electronics and Computer Engineering Technology (ECET). The program is cooperatively designed to provide for technical certification and/or transfer opportunities to baccalaureate degree programs at the University of Hawaii-Manoa or distance education offerings at the Maui Research and Technology Center from the University of New Mexico. The second stage focuses on developing multimedia laboratory exercises for the ECET curriculum in a format transportable to outreach by reducing dependence on costly laboratory equipment and faculty travel. This innovative format utilizes simulated laboratory experiments by developing, purchasing, and integrating multimedia software for CAI workstations. The ECET program is being field-tested on the main campus and then extended to the college outreach centers, and is recruiting students from MCC's densely-populated Pacific Island and Asian community. The third stage is the extension of the simulated methodology to other science and mathematics courses at the college. The final stage involves teacher and faculty enhancement. Effectiveness of this approach is being demonstrated through scheduled workshops for other college instructors state-wide and to secondary school teachers. The project results are being disseminated on a national level.

Title: Technical Sciences Academy Proposal

Therese A. Jones
Amarillo College
Amarillo, TX 79178

DUE 9454651
FY1994 \$ 630,000
Advanced Technological Education

This project is creating a Technical Science Academy as a division within the Amarillo Scientific Arts Academy. The Academy serves secondary and post-secondary students from Amarillo and the surrounding area through state-of-the-art curricula and laboratories in mathematics, science and technology. The project is providing a hands-on curricula for majors in Electronics Engineering Technology and Hazardous Materials Technology. The project implements a seamless educational strand which removes barriers between secondary and post-secondary levels. Team teaching, proficiency based curricula and cooperative learning are the major emphasis of the project, as well as the implementation of internships, cooperatives and interactions with industrial partners for faculty and students. The project is appealing to underrepresented groups including women and minorities. This project grew out of a committee effort which brought together educators and business/industry leaders to generate realistic ways to address national education goals.

Title: Advanced Technical Education (ATE) Alliance

James A. Jordan
Consortium for Advanced Manufacturing International (CAM-I)
Arlington, TX 76011

DUE 9454655
FY1994 \$ 499,950
FY1995 \$ 499,950
FY1996 \$ 499,950
Advanced Technological Education

This project is developing, delivering, and evaluating a national curricula to educate technicians who are employable in 21st century manufacturing enterprises. Instructional delivery is being assisted by distance learning technology and the National Information Infrastructure. Added funding comes from local, state, and other federal sources. CAM-I is leading an Advanced Technical Education (ATE) Alliance, including as members Lawrence Technological University, C.S. Mott Community College, and the Goodrich, Michigan area schools, and affiliates from other school districts in the Flint, Michigan area, clusters of community colleges, school districts, and CAM-I company members in Oak Ridge, Tennessee; Kansas City, Missouri and Kansas, Los Angeles, California, as well as the Mescalero Apache Reservation NM, Lehigh University and National Technological University.

The knowledge and skill needs for a new breed of agile technicians, able to respond knowledgeably, effectively, and quickly in highly competitive, rapidly changing global manufacturing, are being addressed. The ATE Alliance is meeting these needs by combining existing best practices modules, already developed by its members and affiliates, with newly developed modules in an integrated, flexible, grade 11-14 program in mathematics, science, communications, computing, and manufacturing enterprise technologies in a pilot program centered at C.S. Mott Community College and Goodrich Michigan area schools.

The Alliance is sharing the modules using nationally scaleable distance learning techniques. The curricula are being reinforced with teacher training, job site education for teachers and students, and public information programs. The ATE Alliance is establishing a virtual school, combining a national network of educational resources to provide locally and temporally optimized education for employability. The pilot curriculum modules are being disseminated via distance learning techniques to the members and the affiliated associate degree granting institutions and school districts. The curricula is being evaluated through performance based assessment. Successful modules are being further disseminated throughout the United States by CAM-I in publications, public forums, and through CAM-I's national network of industrial members. The ATE Alliance provides 21st-century education in clusters with large, diverse minority populations, preparing students for employment in challenging and rewarding careers.

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Title: Advanced Technological Education in Biotechnology: A Community College Partnership with Industry

Barbara Des Rogers
Peralta Community College District Office
Oakland, CA 94606

DUE 9454657
FY1994 \$209,073
Advanced Technological Education

This project involves an integrated and vocational enriched program in biotechnology. The program leads to a certificate and associate degree; incorporates basic science, computer use, applied mathematics, reading skills, writing skills, and critical thinking. Committed partnerships include industry, a 2-year college, secondary schools, and government. The project also address the needs of a rapidly changing workforce by reducing barriers for entry of women and minorities into science and mathematics based occupations. New instructional methods are being incorporated into the curriculum, and cooperative learning environments are provided through mentorships and internships with industry.

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Special Projects

Title: Curriculum and Pedagogy Standards for Two-Year College and Lower Division Mathematics

Marilyn Mays
AMATYC
Memphis, TN 38134

DUE 9443721
FY95 ATE \$24,300 (TOTAL \$ 34,300)
Advanced Technological Education

The recent focus in the mathematical community on calculus, advanced technology education, teacher preparation and reform at the K-12 level is providing a framework to consider mathematics courses taught at two-year colleges and lower division mathematics courses taught at other institutions of higher education in this country. These courses are important elements in continuum and pipeline issues, as well as general mathematical needs of students not continuing in mathematically oriented fields of studies. The American Mathematical Association of Two-Year Colleges (AMATYC) is undertaking a leadership role in designing a framework for systematic reform of college mathematics in the curriculum leading to calculus.

The first stage was a meeting of an AMATYC National Steering Committee consisting of leaders of AMATYC, MAA, and NCTM as well as others actively involved in the development of innovative mathematics curricula and Standards. In the second stage a small invited conference of a National Task Force was held to establish guidelines for the development of a set of Standards for two-year college and lower division mathematics and to formulate a plan to build consensus for mathematics reform among two-year college and university constituencies.

The AMATYC Standards Project is designed to plan, write and disseminate standards for curriculum and pedagogy for two-year college and other lower division undergraduate mathematics courses; in particular, mathematics courses below the level of calculus are being addressed. This project is filling an important need, serving as a connecting bridge between the NCTM Standards, related projects at the secondary school level, and the reform efforts in calculus at the college level.

This supplement is allowing for a final revision of the Standards document based on input from the mathematics community with special attention to those involved in technical education, teacher preparation and dissemination to the community. This third stage in the development of standards involves the establishment of a council to advise on special issues including workforce development, technical education, teacher preparation, and diversity.

Title: Faculty Development and Dissemination for ATE Program

American Association of Community Colleges
Lynn Barnett
Washington, D.C.

DUE 9540310
FY1995 \$ 15,439
Advanced Technological Education

This supplement is designed to augment an outreach grant to the American Association of Community Colleges (AACC) for faculty development and dissemination for the ATE program. In particular these funds are augmenting a previous grant to allow AACC in conjunction with the NSF to host a preconference leadership meeting and a FY1994 ATE principal investigator's meeting. The workshops focus on developing a vision for the future of technological education. The overall issue addressed is: "Building and implementing a program to impact and shape the quality of the technological workforce." The purpose of a preconference workshop which brings together 20 to 25 national leaders of industry, government and education, is to focus on critical issues related to advanced technological education; to develop a vision for the future of technological education; and to discuss how the NSF's ATE program can impact and improve technician education at the National level. The principal investigator's (PI) conference bring together the PI's from FY94 awarded Centers and Planning Grants for Centers, as well as those from the large curriculum projects.

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Title: The Two-Year College in the Twenty-First Century: Breaking Down Barriers

Mary Monroe
Southwest Texas Jr College
Uvalde, TX 78801

DUE-9450160
FY1994 \$208,348
FY1996 \$358,975
FY1997 \$360,125
FY1998 \$257,957

The project is improving learning opportunities for students at two year colleges--those that transfer, those that become technicians in the high-technology workplace, and all students for whom physics serves as a part of their college education. The project is establishing a network of physics faculty in two-year colleges. The network consists of 15 regional organizations, coordinated and linked by a national steering committee. The development of the network of colleagues allows two-year college faculty to share their successes as teachers and scholars with each other and with the broader physics community; it increases their awareness of current developments in physics education research and innovative teaching strategies; and it decreases the sense of isolation felt by many two-year college faculty members.

During the four year project, fifteen Regional Coordinators and their Regional Teams, selected and mentored by a Steering Committee, are organizing and hosting small local meetings and leading participants as they develop projects and programs within their regions relating to critical and topical issues that may be particularly important in the region. Many of these issues is being developed from the work begun at the 1989 topical conference entitled "Critical Issues in TwoYear College Physics and Astronomy - 1990 and Beyond" supported by the American Association of Physics Teachers (AAPT) and the National Science Foundation (NSF) and at the 1992 NSF Workshop on the "Role of Professional Societies in Science, Technology, Engineering, and Mathematics Education in Two-Year Colleges". To enlarge the network and provide a national forum, the Regional Coordinators and three elected delegates from each region are participating in a national meeting, convened as an AAPT Topical Conference, where various speakers and consultants are engaging participants in a more global discussion of critical issues and issues of particular and timely pedagogical significance. Conference participants are making recommendations for national reform.

In the project, the Steering Committee is producing three proceedings from annual meetings, will compiling and publishing demographic data better describing the two-year college physics education communities, and writing a major report characterizing the two-year college faculty and its impact on the physics education community of our country. In addition, fifteen regional structures are being established, under the auspices of AAPT, which allow for the continued collaboration on issues of importance to the physics education communities.

Title: A National Workshop to Develop a National Agenda for the Future of Engineering Technology Education

George H. Sehi
Sinclair Community College
Dayton, OH 45402

DUE-9550659
FY1995 \$ 111,319
Advanced Tech. Education

A three-day invitational workshop is being held to examine issues and charter a national agenda for the future of engineering technician education. The workshop involves key individuals from business and industry, engineering and engineering technology educators, top level administrators from two-year colleges, and government representatives. The workshop participants are involved in predicting, identifying, and rank ordering the changes that must occur in the engineering technology education process over the coming decade. In multiple breakout sessions the participants discuss many diverse issues; such as Future Demand for Technical Skills; Nature of Future Technical Employment; Industry Recognition of Associate Degree Engineering Technicians, Curriculum Changes for Educating Future Technicians; New institution Tools, Technologies and Techniques; Accreditation and Policy Issues; Strategies for Development and Implementation of Alternative and Innovative Programs; Effectiveness of Various National Movements (Tech-Prep, School-to-Work, etc.); Preparation of Future Community College

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Engineering Technology Faculty; Articulation with Four-year Engineering, Engineering Technology, and other Science and Technology Programs; Assessment Process and Academic Standards; Role of Professional Societies and Professionalizing Technician Careers; and Varied Paths for Technicians.

The workshop report is being disseminated to academic Institutions, private sector, and selected government agencies. Planning and implementation of the workshop is a cooperative effort involving Sinclair Community College, the American Society for Engineering Education (ASEE), the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET), and the National Science Foundation (NSF).

Title: Community College Science Connection Conference

Alfred Wohlpert
Oak Ridge Associated University
Oak Ridge, TN 37831-0117

DUE-9552954
FY1995 \$ 40,000
Advanced Tech. Education

The Community-Senior College Science Connections conference is enhancing collaboration and articulation between community colleges and senior colleges in science and mathematics education and teacher preparation. The conference seeks enhanced partnerships in science and mathematics education at the undergraduate level and improved student awareness of science and mathematics teaching as a career. The workshop is focusing on communication and cooperative interaction between 2- and 4-year institutions in science and mathematics education and teacher preparation; improved science and mathematics instruction in introductory science and mathematics courses; baseline information on partnerships to share as a vital career choice, and regional groups to work for systemic impact. The workshop is resulting in a report of partnerships and a proceedings of the conference and the establishment of an Internet home page for Community-Senior College Science Connections information.

Title: Physics Education in the Two-Year Colleges: A Neglected Resource

Michael Neuchatz
American Institute of Physics
College Park, MD 20740

DUE 9453180
FY95 ATE \$ 100,000 (TOTAL \$199,988)
FY96 \$93,000
FY97 \$92,692

Two-year colleges have the potential to provide education programs which produce a technically sophisticated workforce able to respond to the changing needs of the U.S. economy. In addition, there have been calls to reform and update the science and technology programs at these institutions. Yet, surprisingly little is known about existing programs or the faculty who lead them. In order to assess the success of the reforms that are being proposed, it is essential to have an understanding of current conditions in these programs. There are several reasons to examine physics in detail at the two-year college level: 1) The existence of detailed information about physics education at both the high school and four-year college level allows physics education at the two-year college level to be placed in a broader context; 2) Physics courses are among the core requirements for most technology-based programs at two-year colleges, and thus help define the overall quality of these programs; and 3) Since physics is relatively well-defined as a discipline and its two-year college faculty small in number, the study serves as a model that can be applied to other disciplines. The primary vehicle for studying physics education at two-year colleges is a survey of all full-time and part-time faculty who teach physics. A two-stage approach is being employed to define this population. Academic deans and directors of vocational programming at each two-year college are being asked to identify relevant department chairs, who are then be asked to indicate all full- and part-time faculty who teach physics. The project design anticipates a high response rate from both groups.

All faculty identified by the chairs are receiving a detailed questionnaire seeking information about their workloads, education and employment backgrounds, the facilities and resources available to them, opportunities for professional development, teaching methods and institution materials used, the nature of articulation agreements

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with nearby high schools and four-year colleges, and other key indicators of their work environment. In addition to the survey, face-to-face interviews with chairs and faculty (both full- and part-time) are being conducted at twelve two-year colleges, chosen to reflect the variation in institutional size and control, academic orientation, and geographic region. The interviews provide an opportunity to probe issues which are not easily captured in a self-administered format. In addition, 6 to 8 students at each institution are participating in a student focus group. The students' perspectives on the quality and difficulty of their physics courses, their interactions with the physics faculty, their reasons for taking physics, and their educational goals are enhancing the information gained through the faculty survey and interviews. The results of this research are coordinated with other higher education studies and disseminated to representatives of local industries, department chairs and faculty at two-year colleges, high schools, and four-year colleges, and other professional organizations active at the two-year college level. The investigators are actively collaborating with two-year college groups to provide relevant and timely information to current and proposed regional two-year college development programs.

Title: Ethics and Biotechnology: A Blueprint for the Future

Catherine Propst
Northwestern University
Evanston, IL 60208

DUE-9554445
FY1995 \$69,980
Special Project

This project is a workshop on "Ethics and Biotechnology: A Blueprint for the Future". The Directors of the Biotechnology Center at Northwestern University are collaborating with the Executive Officer at Palomar College, a two year college in San Marcos, California and with Providence St. Mel, an inner city high school in Chicago. The workshop, Northwestern University's Evanston Campus is designed to provide a blueprint for the incorporation of ethics in the teaching, practice, and management of biotechnology. The information is being used to add to the biotechnology curricula for technician education and to encourage joint efforts by secondary schools, two-year colleges, four-year colleges and universities, and industry. In addition, it provides a mechanism to develop creative ways for ethics for biotechnology technicians to be taught, practiced, and managed in their respective institutions.

Title: Expanding the Network of Community Colleges in Advanced Science and Engineering Technology Education

James Mahoney
American Association of Community Colleges
Washington, DC 20036-1176

DUE 9552975
FY1995 \$237,320
Advanced Technical Education

The American Association of Community Colleges is conducting a two year project consisting of a series of interconnected activities designed to enhance the quality of science, mathematics, engineering, and technological education in community colleges. The activities include (a) two national meetings approximately one year apart of representatives from groups interested in science and engineering advanced technological education including the principal investigators from many current Advanced Technological Education (ATE) projects and centers, private and public sector leaders, and professional associations; (b) a roundtable of experts on issues in science and engineering advanced technological education; and (c) a live national teleconference on such issues. The sequence of programs is designed to provide people interested in advanced technological education opportunities to network with one another; identify significant issues related to the delivery of effective science and engineering technological education; disseminate the results of these activities to a broad national audience; and, broadcast a national teleconference on these issues.

Expected outcomes include a sharper understanding of the characteristics of successful science and engineering technological education programs for all stakeholders in this area, the development of additional resource documents of use to current and future participants in these educational programs, and an increased awareness of the value of each of these activities for delivering information to a broad audience.

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Title: National Forum on Critical Issues in Environmental Technology Programs at Two-Year Colleges

Ellen Kabat
Eastern Iowa Community College District
Davenport, IA 52803-2012

DUE-9453181
FY1995 \$ 83,202
Advanced Technological Education

A two day invitational workshop is being held to examine critical issues relating to environmental technology education. The workshop involves postsecondary educators in the fields of mathematics, science, environmental education, and technology as well as employers, secondary school educators, and government representatives. Forum participants are identifying and prioritizing issues and developing recommendations concerning Environmental Technology education at two-year colleges. Each working group is being directed by a technical working group chair recognized as an expert in a particular area. The working groups are addressing issues in the professionalization of environmental technician education; curriculum and program development and implementation; preparation, credentials, professional advancement, and continuing education of faculty; human resources including recruitment, retention, and placement of students; current and future employment needs for environmental technicians; and preparation of secondary school students for successful entry into postsecondary environmental technical education programs.

The workshop report is being distributed to academic institutions and the private sector as well as local and federal government staff interested in environmental technology education. Planning and implementation of the forum is a cooperative effort involving the NSF Advanced Technology Environmental Education Center (ATEEC), the Hazardous Materials Training and Research Institute (HMTRI), the American Association of Community Colleges (AACC), and the National Science Foundation (NSF).

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ATE Contributions to Other Funded Projects

The ATE program is contributing funds to projects submitted to several other programs to help ensure that these projects make the education of technicians a project product. The ATE contribution is given here and the total award from all other sources is listed in parenthesis.

Title: Introduction to Molecular Biology and Molecular Diagnostics: Continuing Education for Community College Science Faculty

George E. Bruening
University of California
Davis, CA 95616-8671

DUE-9455068
FY1995 ATE \$ 100,000 (TOTAL \$ 450,000)
Life Science Biological

This is a proposal for multi-year funding in support of an integrated and expanded instructional program for community college faculty. The proposal will introduce molecular biology and molecular diagnostics as continuing education. The proposed program will continue to offer the week-long summer institute in molecular biology and add to that a new summer institute in molecular diagnostics in which the principles of molecular biology find applications in several areas of biotechnology. In addition, it will expand follow-up program services and other participant contacts with university faculty and industry researchers. Internships for community college faculty will continue as a part of the program.

Title: REU-Site for Biotechnology

Bruce Jackson
Massachusetts Bay Community College
Wellesley, MA 02181-5359

BIR-9424103
FY1995 ATE \$15,000 (Total \$ 65,796)
FY1996 ATE \$15,000 (Total \$ 70,296)
FY1997 ATE \$15,000 (TOTAL \$ 70,296)

Through this award, the Directorate for Biological Sciences and the Advanced Technological Education (ATE) program of the Directorate for Education and Human Resources award is providing support for an innovative summer program that targets students from two year colleges, a student population that typically does not participate in REU-sites programs. During the first two summers, participants are being extensively trained in various techniques used commonly in molecular biology and biotechnology research at the Massachusetts Bay Community College in Wellesley Hills, MA. During the third summer, participants use this technical knowledge to pursue independent research at the Marine Biological Laboratory in Woods Hole, MA or the Science Park biotechnology center in New Haven, CT. The aim of the program is to equip students with the confidence and experience necessary to enter and complete training in science.

Title: Middle Atlantic Consortium for Mathematics and Its Applications Throughout the Curriculum

Dennis DeTurck
University of Pennsylvania
Philadelphia, Pennsylvania 19104-6395

DUE 9552464
FY1995 ATE \$75,000 (TOTAL \$598,206)
FY1996 ATE \$50,000 (FY1997 \$ 499,653)
FY1998 \$ 499,653
Mathematical Sciences

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This project is designed to promote a climate in which faculty from all disciplines view themselves as being jointly responsible for the scientific, mathematical, and technical education of undergraduates, rather than clients and servers. To help accomplish this, a consortium comprised of the University of Pennsylvania, Villanova University, Polytechnic University, Community College of Philadelphia, two Philadelphia public schools, and the Society for Industrial and Applied Mathematics (SIAM) is planning to undertake this major initiative to integrate research and real-world applications from various disciplines into the mathematics curriculum, and to achieve more effective integration of advanced mathematics and computing into the curricula of disciplines that use mathematics.

To begin a process to achieve this overall goal, this project consists of four parts:

- I. Creation of application modules for mathematics courses and mathematics modules for other-discipline courses.
- II. Development of basic and advanced interdisciplinary courses that integrate mathematics with specific application areas.
- III. Development of applications and laboratory-oriented courses for mathematics majors.
- IV. Development of materials for students in courses such as business, economics, psychology, and liberal arts and humanities courses that focus on mathematical literacy issues.

Topics are chosen from a broad range of discipline areas, including biological and social sciences, as well as engineering, business, and physics modules. These modules involve many different important mathematical topics and techniques. The two different types of modules which are planned allow for multiple levels of student backgrounds. They impact multiple points of the curriculum ranging from courses for majors in fields which have traditionally used little or no mathematics to those for lower division students in mathematics and mathematically oriented disciplines to those for upper division mathematics majors. Several interdisciplinary courses are being created, including one incorporating mathematics, physics, and chemistry as well as one in geographimetry. A team of faculty are also developing a two-semester course for mathematics majors that surveys industrial uses of mathematics via applications. SIAM is proving expertise both in the development of the interdisciplinary modules and courses and in broad dissemination of materials through conferences, workshops, and products. Distribution of materials is through World Wide Web sites at the University of Pennsylvania and SIAM as well as by commercial publication. Two particular areas of emphasis in the program are at the use of application and technology for students pursuing careers as technicians in the industrial/scientific workplace and the preparation of future secondary teachers.

Title: Mathematics and its Applications in Engineering and Sciences: Building the Links

Isiam E. Boyce
Rensselaer Polytechnic Institute (RPI)
Troy, NY 12180-3590

DUE 9552465
FY1995 ATE \$125,000 (TOTAL \$ 1,311,000)
FY1996 ATE \$125,000 (TOTAL \$ 700,000)
FY1997 ATE \$125,000 (TOTAL \$ 700,000)
FY1998 ATE \$125,000 (FY1998 \$ 700,000)
(FY1999 \$ 600,000)
Math Initiative

The division of courses into many different departments often makes it difficult for students to grasp the intimate connections that exist between mathematics and its applications in engineering and science. To make these connections clearer RPI is developing a library of hypertext documents that link important mathematical topics with contemporary interesting applications in various fields of engineering and science. This library covers the mathematical areas normally studied by undergraduate students in engineering and science, including calculus, differential equations, mechanics and linear systems, advanced mathematical methods, and probability and statistics. The library that is created initially constitutes the basis for a constantly expanding resource that is support a growing movement, at Rensselaer and elsewhere, to move away from a lecture-dominated mode of instruction to a workshop or studio mode. The development of these materials is involve a collaboration among faculty at Rensselaer and at a number of other Institutions, including the University of Delaware, Siena College, Virginia Polytechnic Institute, Central State University, Hudson Valley Community College, and the University of Maryland. By means of Visiting Professorships, faculty at several other institutions are also becoming involved as the project develops. After careful

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testing and evaluation, the library of hypertext documents is being made available on the World Wide Web, on CDs, and in printed form. Among the added benefits to Rensselaer and the other Institutions directly participating in the project is a much enhanced level of cooperation among faculty who teach related courses in many different academic departments. The project is developing and testing materials that enhance the use of applications and technology.

Title: Young Scholars Program

Jerry J. Brand
Univ. of Texas Austin
Austin, TX 78712-9998

ESIE-9452693
FY1995 \$ 60,975
Young Scholars Program

This project is initiating a one year pilot Young Scholars program lasting 4-weeks in the summer in Advanced Technology Education for twenty four high school students. The program emphasizes advanced technology, design, applications. In addition to several other applications, Computer Aided Design (CAD) projects integrate various components of technology and its uses. Evening seminars are being concerned ethics and other topics concerning technology and the citizen. There are being field trips to major industrial locations where advanced technology is used, as well as recreation and reading during the weekends and evenings. Students who exhibit a high potential for careers as technicians are being recruited nationally for the program.

Title: West Hawaii Explorations Academy: A Center for Integrative Secondary Curriculum Development

Bill Woerner
Hawaii Dept of Education
Honolulu, HI 96816

ESIE-9452790
FY1995 ATE \$75,000 (TOTAL \$ 119,958)
FY1996 ATE \$75,000 (TOTAL \$ 131,654)
FY1997 ATE \$75,000 (TOTAL \$ 98,728)
Instructional Materials Development

This project is establishing a secondary educational facility which differs fundamentally from traditional classroom education. The West Hawaii Explorations Academy is an operational project and work experience laboratory for secondary students, while also serving as a Center for integrative curriculum development and teacher training. The project is headquartered at the Natural Energy Laboratory of Hawaii, a state funded incubation facility for scientific research and commercial operations in aquaculture and energy development. Approximately one hundred thirty three 10th through 12th grade heterogeneously selected students, including high-risk students, work and study full time throughout the school year. Students team with peers, staff, University of Hawaii faculty and students, graduate students, mentors, community members, and employers. Rather than attend classes, students receive credit for all of their core courses by managing and staffing a wide variety of projects. These include aquaculture and cold water agriculture research and production, alternatively-fueled vehicle research, environmental projects, aquarium site development, desalination, alternative energy development, sustainable research, and marine environments. While engaged in project work, they take modules in Records/Business/Finance, Media/Publications, Research Support, Facilities, Leadership and Reading/Writing. The vision is partnering with a research laboratory, a university and the community to develop a new model for education with the following goals: a) enhance the prospect that students, including high risk youth, go to college or are employed, b) encourage inservice teachers to adopt an integrative teaching style, c) develop pre-service teachers who can implement an integrative program and modify the curriculum for high risk students, d) increase the science, math and engineering expertise available to students, e) serve as a national model program in expanding education beyond the walls of the classroom and attract community and university resources, and f) prepare and distribute a collection of exemplary materials with national scope which promote and facilitate integrative education at the secondary level. An external evaluator carefully documents project activities and student outcomes so the results can be disseminated to the profession.

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Title: Establishing New Traditions: Revitalizing the Curriculum

John W. Moore
University of Wisconsin-Madison
Madison, WI 53706

DUE-9455928
FY1995 ATE \$100,000 (TOTAL \$949,968)
FY1996 ATE \$50,000 (TOTAL \$899,999)
FY1997 ATE \$50,000 (TOTAL \$899,941)
(FY1998 \$499,941)
(FY1999 \$499,742)
Chemistry Initiative

This project is establishing new traditions in the chemistry curriculum that optimize opportunities for all students to learn chemical facts and concepts, develop and pursue interests in chemistry and chemistry-related disciplines, and appreciate how an understanding of chemistry is important to life and living. The project is changing fundamentally the ways students, faculty, and administrators view their roles, creating a student-centered, active-learning emphasis. There are a broad range of reforms, each of which is developed, tested, modified, thoroughly evaluated, and widely disseminated. There are five main areas that apply to all levels of the curriculum: student-focused active learning; inquiry-based/open-ended laboratories; interdisciplinary course clusters to create learning communities; a topic-oriented curriculum; and information technology/computer tools. Each development in each area is carefully evaluated, and only the best survive. Evaluation provides important information about the process of transfer of innovations among Institutions of different types. To insure that the reforms are useful for all students, the consortium includes industry, public and private four-year institutions, minority institutions, and two-year colleges. The project gives special emphasis to students who choose teaching as a career option by main-streaming these students in courses which benefit them in both content and pedagogy. Students, including those in science education, are fully integrated in the development and implementation of the project, working on both research topics and evaluation. The project also gives special emphasis to community college students in Advanced Technological Education programs to ensure that they are provided the newly developed curriculum. The students in the ATE program clearly benefit by being provided the five main areas of thrust that this coalition is developing. All students emerge with greater comprehension and better retention of chemical knowledge, improved ability to apply chemical concepts to new problems, enhanced appreciation of the relation between chemistry and other disciplines, and skills that enable them to work effectively in multidisciplinary teams.

Title: Sweeping Change in Manageable Units: A Modular Approach for Chemistry Curriculum Reform

C. Bradley Moore
Univ. of California-Berkeley
Berkeley, CA 94720

DUE-9455924
FY1995 ATE \$100,000 (TOTAL \$ 755,000)
FY1996 ATE \$50,000 (TOTAL \$ 795,000)
FY1997 ATE \$50,000 (TOTAL \$ 795,000)
(FY1998 \$ 350,000)
(FY1999 \$ 350,000)
Course and Curriculum Program

The purpose of this project is to develop new curricula, materials and methods which are enhancing the appreciation and learning of science, especially chemistry, for every undergraduate student such that all college graduates command the knowledge and skills necessary to permit continued learning, lead productive lives, and make informed decisions. To accomplish this mission, a modular approach to teaching chemistry in the first two years of the undergraduate curriculum is being developed and evaluated. Modules of one to four weeks present fundamental chemistry to students in the context of a real-world problem or application and emphasize the links between chemistry and other disciplines. In collaboration with the ChemLinks Coalition, modules are being developed, tested and refined at the two- and four-year colleges and research universities comprising the two consortia. Curriculum materials, including text, lab, and multimedia components suitable for students from diverse cultural and ethnic backgrounds and usable at a wide variety of undergraduate Institutions are being produced and distributed by an established publisher. Teaching methods which utilize current understanding of learning processes and emphasize active learning and the full spectrum of modern technologies are being supported, tested and

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promulgated. A model support infrastructure for development and assessment of new materials and methods is being provided. A framework for continuous improvement of curricula is resulting from the work and be Institutionalized within the consortium. Faculty workshops and sessions at national and regional meetings are being conducted to guarantee dissemination. The consortium institutions now participate significantly in pre-service teacher training and education of technology specialists and are developing new programs in these areas. Thus, the program is strongly impact the Advanced Technological Education and Teacher Preparation Programs by developing modular materials appropriate to the task of educating future teachers and technology specialists.

Title: ChemLinks Coalition: Making Chemical Connections

Brock Spencer
Beloit College
Beloit, WI 53511

DUE-9455918
FY1995 ATE \$100,000 (TOTAL \$ 705,000)
FY1996 ATE \$50,000 (TOTAL \$ 655,000)
FY1997 ATE \$50,000 (TOTAL \$ 655,000)
(FY1998 \$ 350,000)
(FY1999 \$ 350,000)
Course and Curriculum Program

The ChemLinks Coalition is undertaking a five-year project to change the way students learn chemistry, increase scientific literacy for all students taking chemistry, and promote the process of educational reform. In collaboration with the ModularChem Consortium, faculty are developing, testing, and disseminating modular course materials that use active and collaborative approaches to learning. These materials, focused on the first two years of the chemistry curriculum, start with interdisciplinary questions important to students and to society (the molecular basis of life, the environment, technology), and in answering them develop an appreciation of how science is actually done. This approach is designed to reach a broader student audience more effectively than do traditional courses, an audience that includes students who are members of groups traditionally under-represented in science, non-science majors, and those taking chemistry as a supporting course, as well as chemistry majors. By providing a model for students preparing for careers in teaching, this approach has an impact on Teacher Preparation Programs. Collaboration among faculty from different disciplines and a number of Institutions supports and reinforces those who want to make changes. These leading liberal arts colleges (Beloit, Carleton, Colorado, Grinnell, Hope, Kalamazoo, Knox, Lawrence, Macalester, Rhodes, Spelman, St. Olaf, Wooster) and research universities (Chicago, Washington - St. Louis) already have experience working together on chemistry curricular reform. An alliance with the Advanced Technology Environmental Education Center's coalition of 2-year Institutions assures an impact on Advanced Technology Education Programs. By using the extensive Project Kaleidoscope network to promote reform, the ChemLinks Coalition involves a much larger and more diverse group of institutions in making systemic and sustainable changes in undergraduate chemistry education.

Title: A Workshop Chemistry Curriculum

David K. Gosser
CUNY City College
New York, NY 10031

DUE-9455920
FY1995 ATE \$50,000 (TOTAL \$ 425,000)
FY1996 ATE \$25,000 (TOTAL \$ 425,000)
FY1997 ATE \$25,000 (TOTAL \$ 425,000)
(FY1998 \$ 150,000)
(FY1999 \$ 150,000)
Chemistry Initiative

The City College Consortium, which includes ten senior and community colleges at the City University of New York, and the Universities of Pittsburgh, Pennsylvania, and Rochester, is developing and applying widely a new model of teaching. This model, called Workshop Chemistry, introduces participation and mentorship by recent completes of the course. Small group, student-led workshops are integral to the course structure. Each week two workshops of an hour each complement the lecture and laboratory components. The workshop model provides a

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collaborative learning experience that increases student involvement and provides a new role for students as mentors. In Workshop Chemistry, students learn the problem solving, communication, and teamwork skills crucial for success in the workplace while learning chemistry more effectively. Working together with the faculty, students become an active part of the community of the department. A prototype workshop model has been developed at City College in a general chemistry course for science and engineering majors, and is being expanded and refined for a broad range of courses including preparatory chemistry, chemistry for allied health sciences, organic chemistry, instrumental, and analytical chemistry. The experience of students as workshop leaders provides a natural introduction to teaching that is being formalized through a Teacher Preparation component of the project. The workshop method is also being exploited and applied in curricula for technician training, an initiative relevant to Advanced Technology Education. The project evaluates Workshop Chemistry and disseminates it beyond the bounds of the consortium. Student Workshop Manuals that include the problem solving, model building, and simulation activities of the workshops are being produced for each course. New project partners are being invited to view workshops, to participate in faculty developments, and to implement pilot workshop courses at their own Institutions.

Title: Undergraduate Curriculum Development on Mechatronic Systems Engineering

Tai-Ran Hsu
San Jose State University Foundation
San Jose, CA 951060760

DUE 9455395
FY1995 ATE \$20,000 (TOTAL \$ 290,000)
(FY1996 \$ 113,280)
(FY1997 \$ 90,999)
Course and Curriculum Engineering

The short-term objective of this proposal is to develop five new courses and two laboratories in mechatronic systems engineering by a Task Force that includes faculty members from Mechanical, Electrical, Computer, General Engineering and Physics Departments at the San Jose State University, and from local high tech industry. Two faculty members from Mission College, part of the California Community College System which supplies 70,000 of the incoming students to the California State University System, are also involved in the laboratory development. In addition to new course development significant improvements are being made in 4 existing courses and 5 existing laboratories.

The long-term objective of activities is to establish a center for Mechatronics engineering education built on the success of the above short-term effort. This center is assisting other institutions in the nation to establish mechatronic curricula for single or interdisciplinary engineering departments, as well as for human resource development for industry.

The curriculum is built on three pillars: (1) the fundamental principles of Mechatronic Technology, (2) the hands-on experience, and (3) the application of Mechatronic Technology to the industry in the region. Content in Pillars (1) and (2) is being made readily transportable to other institutions whereas the content in Pillar (3) are being developed with assistance of local industry and can be transported to other Institutions in a similar industrial setting. This model benefits universities and industries in other regions who seek to develop similar models.

Instructional materials developed from this project are being disseminated to other Institutions and industry through computer links by means of multi-media CD-ROMs. Every effort is being made to present results at conferences of various professional societies, as well as publications. The Task Force is also hosting a faculty enhancement workshop to disseminate initial results and to gather additional input after the first year of the project.

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Title: Introductory Biology at Community Colleges: A New Model

Rodger W. Bybee
Biological Sciences Curriculum Study (BSCS)
Colorado Springs, CO 80903

DUE 9455725
FY1995 ATE \$100,000 (TOTAL \$ 450,000)
FY1996 ATE \$50,000 (TOTAL \$ 435,000)
FY1997 ATE \$50,000 (TOTAL \$ 435,000)
Course and Curriculum Life Sciences

In recognition of the importance of introductory biology courses at community colleges to the education of the future workforce and the development of scientific literacy, BSCS is conceptualizing, writing, testing, and evaluating a set of innovative curriculum materials for biology students at the college level. Collaborating in the 36-month project are fifteen partners, including biology faculty at eight community colleges (including several that offer programs in biotechnology and environmental technology that include strong components of basic science), the American Association of Community Colleges (AACC), the two-year college section of National Association of Biology Teachers (NABT), the Society for College Science Teaching (SCST), the American Mathematical Association of Two-Year Colleges (AMATYC), the American Institute of Biological Sciences (AIBS), Ward's Natural Science Establishment, Inc., and Kendall/Hunt Publishing Company (college division). The completed program is being offered an integrated and coherent approach to helping students achieve three major goals of biological literacy: 1) to understand the basic unifying principles of biology; 2) to develop the fundamental skills of critical thinking and scientific reasoning; and 3) to recognize the applications of science, especially relationships among science, technology, and society. The materials that are being developed are of use to future teachers of science at the elementary and secondary levels because strategies are incorporated that encourage students to reflect on the overall design of the program, the strategies that help them learn, various teaching techniques, and assessment strategies. The products of the project include student materials (readings, activities, and laboratory exercises) that support both semester- and year-long introductory biology courses and that emphasize hands-on, open-ended inquiry, collaborative learning, and the relationships among science, technology, and society; an Instructor's guide that provide faculty with extensive background reading and specific implementation support; and a model for a faculty development workshop that is being designed and tested by the partner faculty and is being supported after the end of the project by revenues realized from sales of the program.

Title: Activity Based Physics:Curricula, Computer Tools, and Apparatus for Introductory Physics Courses

Priscilla W. Laws
Dickinson College
Carlisle, PA 17013

DUE 9455561
FY1995 ATE \$75,000 (TOTAL \$725,000)
(FY1996 \$ 525,000)
(FY1997 \$ 525,000)
Course and Curriculum - Physics

Three related activity-based introductory physics curricula have been developed with major support from the US Department of Education and the National Science Foundation. These are Workshop Physics, Tools for Scientific Thinking, and RealTime Physics. All three curricula use the findings of physics education research, are activity-based, and involve the design of computer hardware and software for investigation, data analysis, and dynamic modeling. This three-year collaboration between principal investigators at Dickinson College, University of Maryland, University of Oregon, Tufts University, and Millersville State University is extending, enhancing, evaluating and disseminating activity-based curricular materials, apparatus, and computer tools for teaching introductory physics based on this previous work. The ultimate goals of this program are to continue full scale efforts to improve the scientific literacy of introductory physics students through the mastery of physics concepts, investigative skills, and mathematical modeling techniques and to motivate students to learn more science.

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Throughout the three year period a comprehensive dissemination program is being conducted to reach introductory physics instructors at high school and college levels through workshops, public talks, on-site visits to Institutions, and journal publications. These dissemination efforts is being supported by the commercial distribution of products through J.C. Wiley & Sons, PASCO Scientific, Vernier Software, and Physics Academic Software. Particular attention is being given to developing physics activities suitable for courses designed for future technicians at two year colleges and preservice teachers.

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ILI-FY1995 Awards In 2 Year Colleges

In 1995, many projects were supported through ILI program with an emphasis on advanced technological education. They are included to show the breadth of support for technical education. Instrumentation only projects are supported through ILI.

Title: New Laboratory Experiments in Analog Electronics Course Using Microcomputer based Instrumentation and LabVIEW

Rajappa Papannareddy
Purdue University Research Foundation
West Lafayette, IN 47907

DUE 9550836
FY1995 \$ 26,090
Instrumentation and Laboratory Improvement
Electronics

This project is providing new improved laboratory experiments pertaining to analog electronics courses in a 2-year electrical engineering technology program. Experiments related to temperature effects, nonlinear systems, advanced devices and circuits, and noise effects are being conducted using the microcomputer-based workstation and LabVIEW. The project involves developing new test methods or virtual instruments to characterize the new laboratory experiments. The workstations can also be utilized for other laboratory experiments related to circuit and analog electronics courses in electrical engineering technology and sophomore engineering curricula. In this project, the student's learning behavior and understanding of the concepts related to proposed experiments are also studied. A survey of questions is being devised to get the feedback from students regarding the usage of new laboratory equipment and LabVIEW.

Title: Instrumentation to Apply the Scientific Method and Undergraduate Environmental Science Laboratories

James A. Collier
Truckee Meadows Community College
Sparks, NV 89512

DUE 9550931
FY 1995 \$20,893
Instrumentation and Laboratory Improvement
Environmental Technology

This project enables faculty to design laboratories in an introductory environmental science class that raises the scientific literacy of students with little or no scientific background through applying the pedagogy of learning. New equipment supports the creation of four laboratory exercises. These exercises are designed so that students apply the scientific method using recently developed data collection technology and computer software. The laboratory exercise sequence starts students at a relatively low conceptual level at which learning occurs through manipulating physical objects to observe cause and effect relationships. It concludes with a sampling exercise that involves students with a more intellectually sophisticated level of conceptual and analytical thought. The emphasis placed on intellectual development in this series of laboratory exercises is unique and highly useful in developing scientific literacy. The new equipment introduces scientifically illiterate students to (1) cause and effect relationships in science through the use of a ground water model and computer simulations that allow students to manipulate variables and watch the results, (2) methods of collecting and analyzing data that range from qualitative observations to the use of state-of-the-art environmental sensors and computers, and (3) effective communication of their discoveries and excitement in a written and mathematical form.

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Title: Rapid Prototyping in Draft and Design Technology

Steven E. Wendel
Sinclair Community College
Dayton, OH 45402-1421

DUE 9550953
FY 1995 \$70,316
Instrumentation and Laboratory Improvement
Manufacturing Technology

The Drafting and Design Department is incorporating rapid prototyping as a key element in the revision of the curriculum. Objectives of this project are: (1) to modernize the drafting and design technology curricula by providing the required rapid prototyping laboratory equipment; (2) to establish a rapid prototyping laboratory for hands-on learning concordant with curriculum development recommendations for associate degree engineering technology courses; (3) to implement distance learning technologies for cost-effective rapid prototyping laboratory access by other 2-year associate degree programs; (4) to offer rapid prototyping laboratory access to a regional consortium; and (5) to provide rapid prototyping laboratory access for the university's project to implement, integrate, and pilot implement a national model for manufacturing education. The current basis for design representation is the solid geometric model. New program outcomes are being enhanced by providing students with the opportunity to take the next logical step (i.e., from a solid geometric model, seamlessly and quickly, to an actual prototype of the part to be manufactured). Students acquire additional knowledge and skills at the design - production interface, the type of concurrent engineering that is becoming commonplace in heavily technological advanced manufacturing operations.

Title: Automated/Instrumentated Open Channel Hydraulics Laboratory

Marshall R. Boggio
Ocean County College
Toms River, NJ 08753-2102

DUE 9551137
FY 1995 \$38,500
Instrumentation and Laboratory Improvement
Civil Engineering Technology

The focus of the project is on that area of hydraulics dealing with phenomena of open channel flow. Recent natural disaster, such as the Mississippi basin flooding, demonstrate that a greater awareness of the forces of nature and the principles of open channel flow are needed in our society to plan and develop better optimum infrastructures. This project integrates physical laboratory experimentation in hydraulics and data acquisition techniques with engineering calculations to facilitate the graphical/pictorial and animation power of the computer to create an integrated multivisual presentation. The laboratory setting, part of the Civil Engineering Technology and Environmental Studies program at the colleges, is analogous to a modern day process "control room" with multiple displays providing student groups with the capability for interactive learning. Students receive different perspectives of data, relevant equation, experimental dynamics, visual animation, and actual real-world photos/videos of the phenomena under study. System integration requires the utilization of an open channel testing flume structure; computer hardware and software; optical discs; and software (media) production processes to develop a coherent story-line and interactive presentation of the experiment for on-line student understanding. As part of this project, students are being exposed to problems of environmentally related channel flow as experienced in the area. Project outcomes are suitable for demonstrations to K-12 secondary public school students to motivate interest in science and technology.

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Title: Modular Chemistry Laboratory for Community College Student

Mary J. Abraham
Western Iowa Tech
Sioux City, IA 511020265

DUE 9551243
FY1995 \$ 16,659
Instrumentation and Laboratory Improvement
Chemistry

An FT-IR, gas chromatograph, and supporting computers and computer software are being used in a modular course in instrumental analysis. The course is being offered in three modules of 5-weeks each to non- science majors, electronic engineering technology students, and internationally educated students who have had little opportunity to use laboratory equipment. High school students as well as technicians working in local industries have opportunities to learn to use the equipment as well. The project is having a significant impact on undergraduate students by providing access to science within a positive, non-intimidating environment. The challenge is to provide learning experiences and curricular content that are relevant, learner-friendly, interesting, and exciting, and which stimulate the interest of non-science students to enroll in subsequent science courses. A pre and post survey will be given to assess the student interest/knowledge in science. The impact of the project is being disseminated to regional and national ACS and science education conferences.

Title: Instrumentation Laboratory for the Electro-Mechanical Engineering Technology Program

Shahriar Jahanian
Penn. State University-Altoona
Altoona, PA 16603

DUE 9551289
FY 1995 \$36,893
Instrumentation and Laboratory Improvement
Electro-Mechanical

This project provides support facilities for an interdisciplinary instrumentation and measurement course in a newly designed degree in Electro Mechanical Engineering Technology program. Transducers and sensors that are highly interdisciplinary are being introduced. Laboratory experiences of this nature greatly assist students in becoming familiar with numerous types of transducer, data acquisition, principles of data communication, as well as advanced graphical engineering software. Specifically this project (1) introduces both digital and analog instrumentation and measurement to students; (2) allows students to acquire data from transducers in an automated fashion; (3) allows students to use their acquired data for further mathematical and graphical analysis; and (4) introduces the principle of local networking to the students and provides a vehicle for training hands on. The experiments in this laboratory are designed to be flexible in order to permit modification and to allow the students to experience interdisciplinary work exercises. The data acquisition, data communication, and post-data- acquisition parts permit the students to become familiar with the theoretical aspects of experiments.

Title: Implementation of Biotechnology in Majors Biology

Martin Ikkanda
Los Angeles Pierce College
Woodland Hills, CA 91371-0001

DUE 9551346
FY 1995 \$12,686
Instrumentation and Laboratory Improvement
Biotechnology

The shortage of modern equipment at the college has prevented biology majors from exploring a significant area of molecular biology, DNA science in the laboratory. Although a good portion of the lecture is spent on cell molecular biology, many of these topics remain abstract and esoteric since students have been unable to perform experiments in the laboratory. This project, involving a 2-year community college, a 4-year university, and private industry, establishes a biotechnology consortium to prepare laboratory investigations that give students hands-on experience with fundamental techniques used in biotechnology. These experiments parallel topics discussed in lectures. The investigations involve: (1) an introduction to DNA science; (2) DNA restriction analysis; and (3) recombinant DNA technology. Individuals primarily affected are biology majors, those preparing for careers in medicine, biological

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research, and teaching. About 200 students per year will use the equipment and protocols of this project. The laboratory investigations are initially being integrated into the major's biology course and microbiology. These experiments serve as a basis for expansion into a separate, biotechnology course and provide the stimulus to initiate a techprep program. The new equipment is so fundamental to performing biotechnology protocols that it can provide the flexibility to allow expansion into these courses.

Title: Improvement of Undergraduate Education in Advanced CNC and CAD/CAM

Joan A. Stepsis
San Diego City College
San Diego, CA 92108-3807

DUE 9551480
FY 1995 \$27,485
Instrumentation and Laboratory Improvement
Manufacturing Technology

The college has recently upgraded its science, engineering, and technology courses to offer students comprehensive associate degree and certificate programs in advanced machine tool and manufacturing technologies. Because defense industry downsizing is forcing manufacturing and machine tool firms into new markets (e.g., biomed, biotech, electronics), CNC operators and CAD/CAM technologists are needed who can use advanced technology to design and produce small, complex parts. To supply graduates for these jobs, the college is developing its undergraduate Machine Technology program into an Advanced CAD/CAM & CNC Technology curriculum. The college and an industry partner are funding new CAD/CAM software delivering advanced surface modeling capability to DOS and NT platforms; this project purchases machine tool components needed to add 4th and 5th axis movement to the College's 3-axis vertical machining center (VMC). Corresponding improvement of Introductory/ Advanced CAD/CAM courses let students use the CAD/CAM software to model and verify advanced CNC surface programs. In improved Introductory/Advanced CNC Vertical Machining & EDM courses, students learn to set up and operate the 5-axis VMC needed to machine their programs. In a new 200 series, Advanced VMC, students use the software and 5-axis VMC to design and execute sophisticated surface models for applied research and industry applications.

Title: BHCC Computer Network Program: Upgrading Microcomputer Technician Skills with a Dedicated Novell Lab

Judith C. Oleks
Bunker Hill Community College
Boston, MA 02129

DUE 9551649
FY 1995 \$33,175
Instrumentation and Laboratory Improvement
Computer Technology

Through this project, the Computer Technology Department is establishing a Novell network system, which is currently the industry standard. The network resembles a real-world local area network, consisting of 18 IBM PCs and 3 Power MAC workstations as well as several printers. The laboratory supports four core courses in a new 1-year certificate program: Introduction to Networks, Network Administration, Advanced Network Administration, and Fundamentals of Internet Work. The college also offers a 62-credit associate degree program in Computer Networks. Eligible students include currently employed computer operators requiring training for career advancement, high school graduates, and clients under the Job Training Partnership Act. Information about the project and its outcomes will be widely shared through the American Association of Community Colleges, the New England Board of Higher Education, Internet, and a summer Tech Prep institute for high school teachers.

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Title: The Western Piedmont Community College Computer Enhanced Mathematics Instruction Project

Odell Witherspoon
Western Piedmont Community College
Morganton, NC 28655-4504

DUE 9551705
FY 1995 ATE \$ 13,700(TOTAL \$38,700)
Instrumentation and Laboratory Improvement
Mathematics

The Mathematics Department at Western Piedmont Community College requires extensive use of calculators in all mathematics courses. College algebra students and calculus students are required to have graphing calculators while other students are required to have scientific calculators with linear regression capability. The integration of computer usage into the mathematics curriculum is the next logical step in the evolution of the College's mathematics program. To achieve this goal, the Western Piedmont Community College Computer Enhanced Mathematics Instruction Project (CEMIP) is enabling the department to equip a multipurpose instructional computer laboratory by providing matching funds for the purchase of 21 microcomputers, four printers, a VGA liquid display panel with an overhead projector, and site licenses for three commercial software packages DERIVE, MAPLE, and MINITAB. The lab is using as a teaching classroom, an assigned computer usage lab, and limited-access lab open for selected mathematics students. Initially, the project concentrate on incorporating computer usage into calculus and statistics instruction, with the ultimate goal of having computer usage integrated into the entire mathematics curriculum including those taken by students studying in technology programs.

Title: Developing a Micropropagation Training Lab

Charles B. Tarrants
SUNY Tech. Delhi
Delhi, NY 13753-1190

DUE 9551715
FY 1995 \$32,644
Instrumentation and Laboratory Improvement
Biotechnology

This project is establishing a Micropropagation Laboratory for training future horticulture technicians. As micropropagation is an asexual method of producing large quantities of genetically identical plants, the lab is a practical application of the concept of Totipotency (i.e., each somatic plant cell contains all necessary information to create an entire new plant). It is technologically intensive, and until recently was not practical on a large/commercial scale. Current advances are allowing the process to see ever greater use in the horticulture industry. Yet the supply of technicians trained in this technique are not adequate for the industry's demand. A curriculum providing systematic training in techniques currently used by industry is being developed to help introduce new innovations from research institutions. Providing such a curriculum is an innovation for the industry. Micropropagation requires a sterile and carefully controlled environment. Students must learn the more rigorous demands of working with plants in such an environment. This project provides the equipment needed to train horticulture students in the micropropagation of a selected assortment of herbaceous and woody plants. The laboratory equipment also serves as the foundation of an expanded horticulture curriculum, offering an option concentrating on micropropagation techniques.

Title: Curriculum Enhancement Through Atomic Absorption Spectroscopy

Michael G. Burke
North Dakota State College of Science
Wahpeton, MO 58875-3602

DUE 9551808
FY 1995 ATE \$ 17,700 (TOTL \$35,655)
Instrumentation and Laboratory Improvement
Chemical Technology

The college is establishing a series of science intensive curricula aimed at students with an interest in science or engineering. The curricula are designed to facilitate students entering the workforce as skilled technicians after 2 years of postsecondary education and an industrial internship. Alternatively, students can continue on to complete

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their baccalaureate degree. This grant is aiding in the implementation of a Chemical Technology curriculum, while enriching chemistry laboratory courses for both vocational and transfer students. The college is acquiring an Atomic Absorption Spectrophotometer to complete the inventory for the Chemical Technology curriculum. Chemical technicians graduating from the college master the operation of the following instruments: FTIR spectrophotometer, gas chromatograph, atomic absorption spectrophotometer, high performance liquid chromatograph, uv/vis spectrophotometer, electrophoretic apparatus, ISE meters and, general laboratory apparatus like balances, ovens, and incubators.

Title: Enhancing Physical Science Curricula Through Computer-Assisted Instruction and Data Image Processing

Gustavo Morales
Valencia Community Coll
Orlando, FL 32802-3028

DUE 9552234
FY1995 \$ 20,327
Instrumentation and Laboratory Improvement
Interdisciplinary

Valencia Community College has a long history of providing a wide selection of comprehensive and high-quality academic programs designed to prepare students to meet changing workforce requirements. The College currently faces the challenge of continuing to fulfill this mission by incorporating appropriate technology into education and training programs for a student body that has become increasingly diverse. This challenge is perhaps greatest in the sciences. Through the project, Valencia is targeting six courses in the physical sciences by infusing computer-assisted learning experiences and data image processing into the curricula. In planning this project, faculty examined several possibilities for incorporating the use of computers into the laboratory setting for the following courses: Earth Sciences, Physical Geology, Historical Geology, Meteorology, Astronomy, and Oceanography. The project is based on the successful curricula developed by the Center for Image Processing in Education in association with the University of Arizona. Image processing provides a powerful medium to excite students about science, especially students from minority groups and others whose needs have not been met by traditional ways of teaching these subjects. Using professional-quality software on microcomputers, students explore a variety of scientific data sets, including earth remote sensing and meteorology data and planetary exploration images. While these courses develop inquiry and research skills for all students, the project encourages more students to pursue professional science and technology careers and provide them with the appropriate training in subject matter and the use of up-to-date technology for the respective fields.

Title: Laboratory Development For Microelectronics Technology

Jenna L. Ware
Texas State College - Sweetwater
Sweetwater, TX 79556-9803

DUE 9552265
FY 1995 \$59,602
Instrumentation and Laboratory Improvement
Electronics

This project enhances improvement of a semiconductor manufacturing laboratory that provides industry-specific microelectronics education for undergraduates. To this end, the Electronics Technology Department is obtaining three pieces of semiconductor wafer testing equipment and a vacuum leak detector. While geared in the main toward Electronics Technology students and Core Electronics students, the laboratory affords new capabilities for crossover electives and in-depth projects for students in advanced courses in Manufacturing Technology, Automation, Robotics, Telecommunications, Computer Maintenance, Drafting and Design, Information Processing, and Industria Management. With high technology used to teach high technology, the semiconductor manufacturing lab emulates current trends in industry and provides students with the higher skill levels required for success in this increasingly complex field. The new equipment is programmable, process-critical equipment that allows students to make wafer tests and measurements usually exclusively limited to small numbers of engineering students at 4-year degree schools. They produce, from the first wafer cleaning to the final electrical test, in real time in a controlled M

DRAFT

4.5 (Class 1000) environment, integrated circuits that differ from those produced in commercial fabs only in their geometries.

Title: Math Projects - Interdisciplinary Education Applications Through Industry Partnerships And Industry - Based Project (MP-IDEA)

Peter Wildman
Casper College
Casper, WY 82601-4612

DUE 9552273
FY 1995 \$15,547
Instrumentation and Laboratory Improvement
Mathematics

MP-IDEA focuses on precalculus classes and is supported by industry partners and by an emerging network of regional colleges. MP-IDEA has 4 components to (1) design precalculus courses that are relevant, that are realistic, and that give students skills and concepts to succeed in future math courses and in the workplace; (2) incorporate the intelligent use of modern technology into the math classroom, specifically, graphing calculators and computers; (3) incorporate alternative assessment practices in the mathematics classroom, specifically, the introduction of industry-based student research projects; and (4) incorporate cooperative learning techniques in the mathematics classroom, thus improving student attitudes, achievement, and interpersonal skills. This project improves mathematics instruction, implements six recommendations of the SCANS report, and serves as a regional model for improvement in postsecondary mathematics instruction. An exceptional element of MP-IDEA is educational partnerships with engineers and scientists at regional industries. These volunteers consult with MP-IDEA faculty to write industry-based math projects specific to the math that students in precalculus courses are learning. The math projects encourage cooperative learning, introduce students to modern technology, and provide a relevant means of assessing student learning.

Title: A Fundamental Component of Engineering Technology

Gerald M. Garriot
Henry Ford Community College
Dearborn, MI 48128-2407

DUE 9552360
FY 1995 \$64,089
Instrumentation and Laboratory Improvement
Electronics

To be successful in the electronics and robotics fields, students must understand the fundamental control devices used in modern industrial electrical systems. Through this project, a new industrial controls laboratory promotes curricular reform, allowing the presentation of concepts and applications in a setting more conducive to promoting "learning as an active process" as recommended by the National Science Educational Standards. Such a laboratory also directly responds to the needs of industrial clients who have participated actively in the redesign of the engineering technology program.

Title: Biotechnology Instrumentation and Laboratory Improvement: Purchase of an HPLC System for Biotechnology

James H. Tulloss
City College Chicago Truman
Chicago, IL 60640-5615

DUE 9552375
FY 1995 \$22,000
Instrumentation and Laboratory Improvement
Biotechnology

This project upgrades the status of the biotechnology laboratory in order to serve the specific training needs of the biotechnology private sector. Students graduating with a degree in biotechnology from the college are conducting analyses using the HPLC in the following areas of biotechnology: (1) analysis, separation, and purification of polypeptides and oligonucleotides proteins including protein variants; (2) pharmaceutical compounds such as water

DRAFT

soluble vitamins, anticonvulsants, antihistamines, catecholamines, antidepressants, and polyaromatic hydrocarbons; (3) compounds sometimes found in air, water, or other natural environments that need to be monitored to maintain a healthy environment; and (4) compounds found in the food industry.

Title: Metallographic Equipment for Manufacturing Processes and Materials Laboratory

Frank J. Rubino
Middlesex Community College
Edison, NJ 08818

DUE 9552389
FY 1995 \$20,080
Instrumentation and Laboratory Improvement
Manufacturing

Microscopy equipment is being utilized within the manufacturing processes and materials laboratory, and laboratory projects are being developed for student use. The microscopy equipment that was used in the Materials Laboratory was limited to the extent that only one person could view the image at any given time. The instructor's ability to provide a meaningful answer to any questions the student asked about the structure was dependent upon the student's ability to describe what was seen. The new use of a video camera and console allows for a more positive identification of and discussion of the observed microstructure, since both student and instructor view the structure simultaneously. Other students benefit from the discussion of the microstructure in question, and all can see that structure. The imaging equipment is giving the student greater flexibility in obtaining photographic images for inclusion in laboratory reports. Using the video camera and digital printer allows making a hard copy without moving the specimen from one instrument to another. Since the digital images are less expensive as compared with the photographic methods currently used, time and money saved allow the individual student to make increased use of the microscopy equipment.

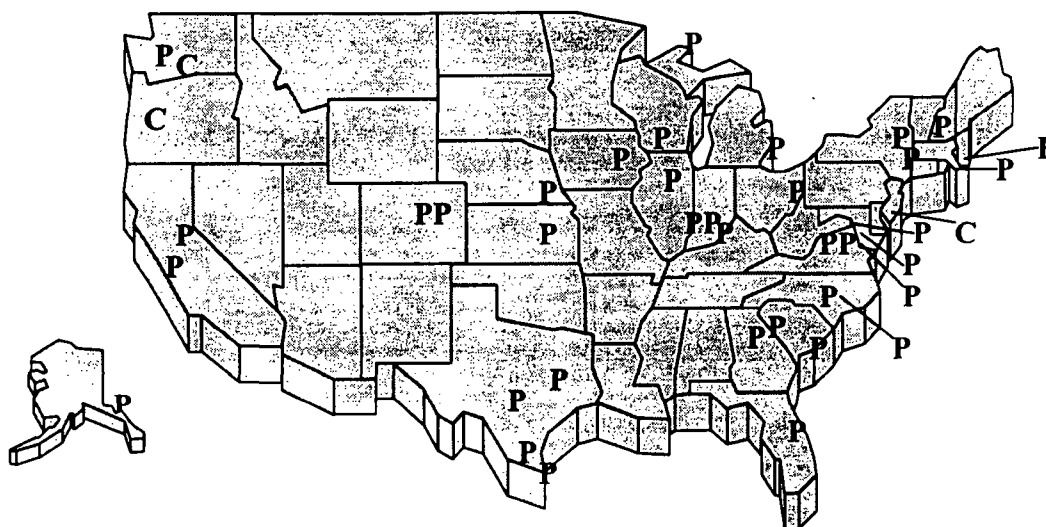
Title: Strain Gage Instrumentation for Analysis of Trusses and Other Mechanical Assemblies

Gregory Watkins
Central Piedmont Community College
Charlotte, NC 28235-5009

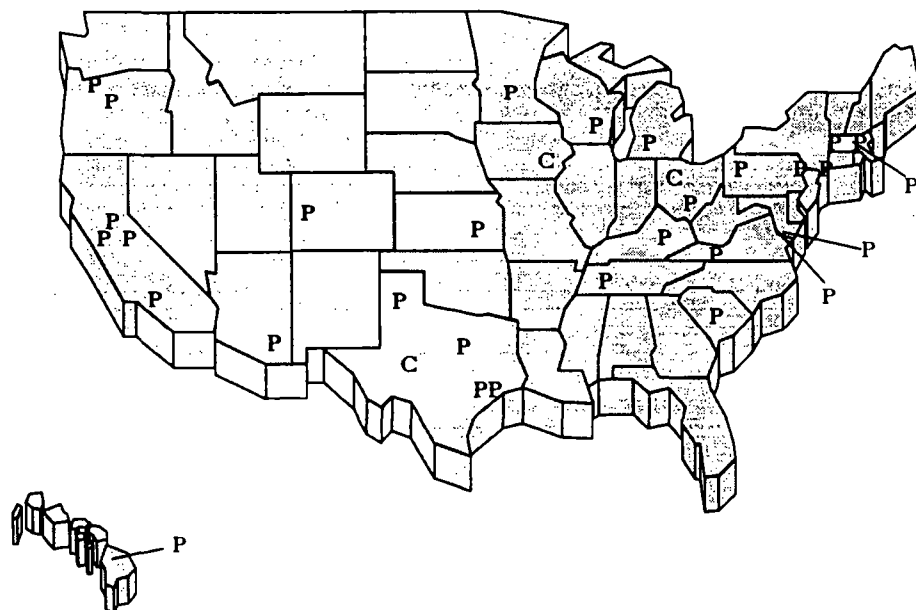
DUE 9552393
FY 1995 \$8,053
Instrumentation and Laboratory Improvement
Engineering Technology

This project has students perform nondestructive laboratory work on truss assemblies and members of varying geometry to verify loads and deflections that were predicted by classroom problem solving. Implementation includes the construction of pin-connected truss models and machine components with varying geometry. These are instrumented with strain gages and appropriate readout equipment in order to demonstrate load sharing and distribution in trusses and the phenomena of stress concentration factors. The project permits the student to manipulate physical models in the laboratory to demonstrate topics that now rely solely on problem solving.

Project and Center 1995 Awards



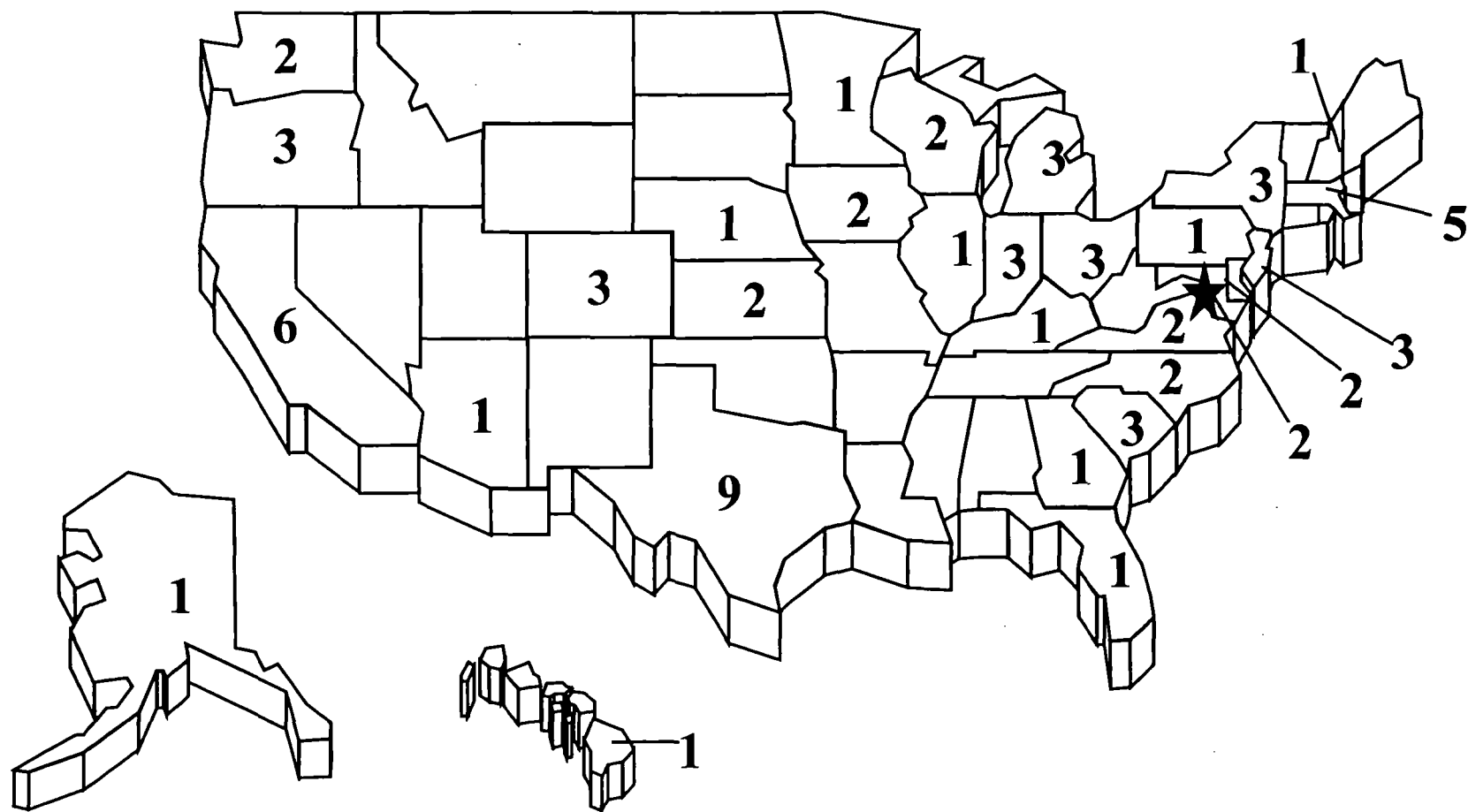
FY94 ATE Continuing Awards



Centers (C)

Projects (P)

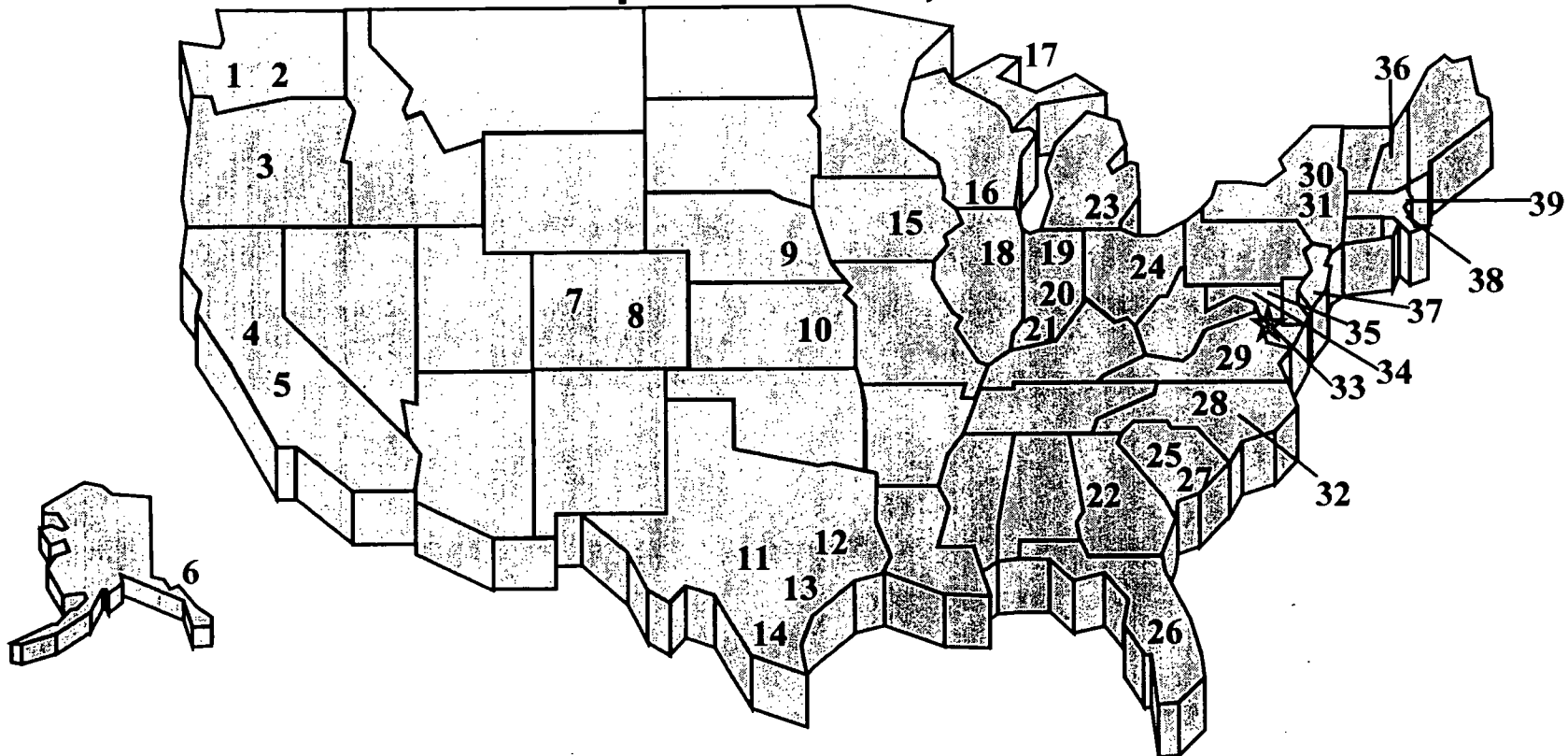
FY95 ATE Supported Projects: New and Continuing



Numbers shown represent total active awards in FY1995

DRAFT

1995 ATE Awards to Institutions **115 Proposals received, 39 Awarded**



- | | | | |
|--|--|--|---|
| 1. Bellevue Community College, WA | 11. Austin Community College, TX | 21. Indiana St. Univ., IN | 31. CUNY, NY |
| 2. North Seattle Community College, WA | 12. Rio Grande Center Manu., TX | 22. Univ. of Georgia, GA | 32. Regional Tech. Strategies, NC |
| 3. Chemeketa Community College, OR | 13. Texas St. Tech. Institute.-Waco, TX | 23. Michigan Tech. Univ., MI | 33. Georgetown Univ., DC |
| 4. De Anza College, CA | 14. Texas St. Tech. Institute.-Harlingen, TX | 24. Stark Tech. College, OH | 34. Prince George's Community College, MD |
| 5. Los Rios Community Col Sys.Distr., CA | 15. Hawkeye Community. College, IA | 25. Piedmont Tech. College, SC | 35. John Hopkins Univ., MD |
| 6. Univ. Alaska SE Juneau, AK | 16. Madison Area Tech. College, WI | 26. Seminole Community. College, FL | 36. Keene State Univ, NH |
| 7. CO Community Col & Occup Ed. St, CO | 17. Wayne St. Univ., MI | 27. Trident Tech. College, SC | 37. Middlesex County College, NJ |
| 8. Front Range Community College, CO | 18. Northern Illinois Univ., IL | 28. NC Brd. of Community Colleges, NC | 38. Wentworth Institute. Tech., MA |
| 9. Southeast Community. College, NE | 19. Indiana Univ.-Purdue, IN | 29. Nat. Assoc. of Bio. Teachers, VA | 39. New England Brd. of Higher Ed., MA |
| 10. Kansas St. University, KS | 20. Rose-Hulman Institute. of Tech., IN | 30. SUNY Adirondack Community. College, NY | |

DRAFT

DRAFT

Index of Awards By State FY1995 Standard and Continuing ATE Awards

DIVISION OF UNDERGRADUATE EDUCATION

ALASKA

Title: Rural Alaskan Environmental Education Program

Gary L. Bowen
U of Alaska SE Juneau
Juneau, AK 99801-8625

ATE Project
DUE 9553680
FY1995 \$ 250,000
FY1996 \$ 250,000
FY1997 \$ 100,000
Environmental

Title: Image Processing for Teaching: Faculty Development and Curriculum Materials

Center for Image Processing in Education
Tucson, AZ 85712

ATE Project
DUE 9454520
Melanie Magisos
\$403,814 (\$1,346,831)

CALIFORNIA

Title: Infusing Technology into the Biology Majors Program

Charles Hoyt
Southwestern College
Chula Vista, CA 91910-7223

ILI Project
DUE 9552290
FY 1995 \$38,570
Biotechnology

***Title: Sweeping Change in Manageable Units: A Modular Approach
for Chemistry Curriculum Reform***

C. Bradley Moore
Univ. of California-Berkeley
Berkeley, CA 94720

CCD Project
DUE 9455924
FY1995 ATE \$100,000 (TOTAL \$ 755,000)
FY1996 ATE \$50,000 (TOTAL \$ 795,000)
FY1997 ATE \$50,000 (TOTAL \$ 795,000)
FY1998 \$ 350,000
FY1999 \$ 350,000

Title: Advanced Biotechnology Education Project

Shahla Sheikholeslam
De Anza College
Cupertino, CA 95014-5702

ATE Project
DUE 9553708
FY1995 \$ 225,306
Biotechnology

***Title: Theme Curriculum: An Integrated Curriculum Development Project In
Support of Advanced Technology Education***

Dave Sinclair
Los Rios CC System Office
Sacramento, CA 95825-3905

ATE Project
DUE 9553717
FY1995 \$ 50,000

DRAFT

Title: Undergraduate Curriculum Development on Mechatronic Systems Engineering

Joan A. Stepsis
San Diego City College
San Diego, CA 92108-3807

ILI Project
DUE 9551480
FY 1995 \$27,485

Title: Improvement of Undergraduate Education in Advanced CNC and CAD/CAM

Tai-Ran Hsu
San Jose State University Foundation
San Jose, CA 951060760

CCD Project
DUE 9455395
FY1995 ATE \$20,000 (TOTAL \$ 290,000)
FY1996 \$ 113,280
FY1997 \$ 90,999
Manufacturing Technology

Expanding the Biotechnology Education Program in the San Francisco / Oakland Bay Area

California Sate University Foundation Inc.
David R. Stronk
Hayward, CA 94542

ATE Project
DUE 9454502
\$250,000

Preserving the Legacy: A Comprehensive Curriculum and Materials Development Project in Support of Advanced Environmental Technology Education

Sally V. Beaty
Intelecom Intelligent Communications
Pasadena, CA 91105-1937

ATE Project
DUE 9454521
\$499,988 (\$1,499,966)

Advanced Technological Education in Biotechnology: Community College Partnership with Industry

Barbara Des Roschles
Peralta Community College District Office
Oakland, CA 94606

ATE Project
DUE 9454657
FY 1995 \$209,073

PacTec - The Pacific Technological Education Project

Wade Ellis
West Valley Community College System
Saratoga, CA 95070

ATE Project
DUE 9454513
FY 1995 \$300,000

Title: Implementation of Biotechnology in Majors Biology

Martin Ikkanda
Los Angeles Pierce College
Woodland Hills, CA 91371-0001

ILI Project
DUE 9551346
FY 1995 \$12,686

COLORADO

Title: Rocky Mountain Advanced Technology Education Project

Don E. Goodwin
CO Community Col & Occup Ed Sy
Denver, CO 80204-2554

ATE Project
DUE 9553706
FY1995 \$181,170
FY1996 \$117,294

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Title: Introductory Biology at Community Colleges: A New Model

Rodger W. Bybee
Biological Sciences Curriculum Study
Colorado Springs, CO 80903

CCD Project
DUE 9455725
FY1995 ATE \$100,000 (TOTAL \$ 450,000)
FY1996 ATE \$50,000 (TOTAL \$ 435,000)
FY1997 ATE \$50,000 (TOTAL \$ 435,000)
Life Sciences

Title: Electronics Technology Curriculum Development

Brenda L. Bryan
Front Range Community Col
Westminster, CO 80030-2105

ATE Project
DUE 9553685
FY1995 \$ 301,783

Environmental Technology Education Transfer to Native American Tribal Colleges

Karl F. Topper
Mesa State College
Grand Junction, CO 81502

ATE Project
DUE 9454633
FY 1995 \$399,778

FLORIDA

Title: Introductory College Physics 2000 - ICP/2

Alexander K. Dickison
Seminole Community Coll
Sanford, FL 32771

ATE Project
DUE 9553665
FY1995 \$ 429,521

***Title: Enhancing Physical Science Curricula Through
Computer-Assisted Instruction and Data Image Processing***

Gustavo Morales
Valencia Community Coll
Orlando, FL 32802-3028

ILI Project
DUE 9552234
FY1995 \$ 20,327
Interdisciplinary

GEORGIA

Title: Using Multimedia Technology to Enhance Electronics Engineering Technology Programs

Dorothy J. Harnish
U of Georgia
Athens, GA 30602

ATE Project
DUE 9553676
FY1995 \$ 97,975

HAWAII

***Establishing and Transporting; Science, Computer and Electronics Technology
to Rural Minority Students through Simulated Labs and Telecourses***

G. Robert Converse
Maui Community College - University of Hawaii
Honolulu, HI 96822

ATE Project
DUE 9454647
FY 1995 \$499,938

DRAFT

***Title: West Hawaii Explorations Academy: A Center for
Integrative Secondary Curriculum Development***

Bill Woerner
Hawaii Dept of Education
Honolulu, HI 96816

ESIE Project
DUE 9452790
FY1995 ATE \$75,000 (TOTAL \$ 44,958)
FY1996 ATE \$75,000 (TOTAL \$ 56,654)
FY1997 ATE \$75,000 (TOTAL \$ 23,728)
Materials Development)

ILLINOIS

***Title: Biotechnology Instrumentation and Laboratory
Improvement: Purchase of an HPLC System for Biotechnology***

James H. Tulloss
City College Chicago Truman
Chicago, IL 60640-5615

ILI Project
DUE 9552375
FY 1995 \$22,000
Biotechnology

***Title: Development and Field Test of a Supplementary Welding Lab
on Disk for Teachers and Students***

Xueshu Song
Northern Illinois Univ
De Kalb, IL 60115

ATE Project
DUE 9553687
FY1995 \$ 213,851

Title: Ethics and Biotechnology: A Blueprint for the Future

Catherine Propst
Northwestern University
Evanston, IL 60208

ATE Project
DUE-9554445
FY1995 \$69,980
Special Project

INDIANA

Title: Interdisciplinary Courses in Electronics Manufacturing

Elaine M. Cooney
Indiana U Bloomington
Bloomington, IN 47402-1847

ATE Project
DUE 9553699
FY1995 \$ 297,475

***Title: Advancing Geo-technology Education: Providing GIS Remote Skills for
the Workforce of the Twenty-First Century***

William A. Dando
Indiana State University
Terre Haute, IN 47809-0001

ATE Project
DUE 9553694
FY1995 \$ 300,000

***Title: Problem-Based Learning: A Key to Enhanced Performance
in Advanced Technological Education***

Buck F. Brown
Rose-Hulman Institute of Technology
Terre Haute, IN 47803

ATE Project
DUE 9553705
FY1995 \$ 475,000

DRAFT

**Title: *New Laboratory Experiments in Analog Electronics
Course Using Microcomputer based Instrumentation and LabVIEW***
Rajappa Papannareddy
Purdue University Research Foundation
West Lafayette, IN 47907

ILI Project
DUE 9550836
FY1995 \$ 26,090
Electronics

**Title: *National Forum on Critical Issues in Environmental
Technology Programs at Two-Year Colleges***
Ellen Kabat
Eastern Iowa Community College District
Davenport, IA 52803-2012

ATE Project
DUE-9453181
FY1995 \$ 83,202

Title: *Modular Chemistry Laboratory for Community College Student*
Mary J. Abraham
Western Iowa Tech
Sioux City, IA 511020265

ILI Project
DUE 9551243
FY1995 \$ 16,659
Project: Chemistry

IOWA

Title: *Development of a Two-year Associate Degree in Agricultural Technology*
Terry Brase
Hawkeye Community College
Waterloo, IA 50704

ATE Project
DUE 9553751
FY1995 \$ 200,000

ATEEC - Advanced Technological Education Environmental Education Center
Ellen Kabat
Hazardous Materials Training and Research Center
Cedar Rapids, IA 52406

Center
DUE 9454638
\$999,961 (\$2,999,866)

KANSAS

Title: *A National 2 Year Associate Degree Program in Environmental Technology*
Stephen E. Swanson
Kansas State University-Salina
Salina, KS 67401

ATE Project
DUE 9553753
FY1995 \$75,000

***Two-Year Associate of Technology Curriculum Development for GIS/GPS
Technologies***
Kansas State University James L. Keating
Manhattan, KS 66506

ATE Project
DUE 9454618
\$500,000

KENTUCKY

Kentucky Advanced Technological Education Project
Kentucky Community College System
Lexington, KY 40506

ATE Project
DUE 9454585
Anthony Newberry
\$696,300

DRAFT

MARYLAND

Title: Physics Education in the Two-Year Colleges: A Neglected Resource

Michael Neuchatz
American Institute. of Physics
College Park, MD 20740

ATE Project
DUE 9453180
FY95 \$199,988
FY96 \$93,000
FY97 \$92,692

Title: Remote Sensing, Image Processing, and Geographic Information Systems

Patricia A. Cunniff
Prince George's Community College
Largo, MD 20772

ATE Project
DUE 9553662
FY1995 \$ 313,973
FY1996 \$ 293,427
FY1997 \$ 87,541

Title: Integrating Computer Software into Lower Division Engineering Technology Courses

William D. Lauffer
Prince George's Community College
Largo, MD 20772-2199

DUE 9455105
FY1995 \$39,269
Engineering Technology

Title: Associate Degree for Manufacturing Technicians

Arnold H. Packer
Johns Hopkins University
Baltimore, MD 21218

ATE Project
DUE 9553664
FY1995 \$ 499,967
FY1996 \$ 400,000
FY1997 \$ 399,867

Title: Curriculum Enhancement Through Atomic Absorption Spectroscopy

Michael G. Burke
North Dakota State College of Science
Wahpeton, MO 58875-3602

ILI Project
DUE 9551808
FY 1995 \$35,655
Chemical Technology

MASSACHUSETTS

***Title: Teacher/Faculty Enhancement, Curriculum Development and
Laboratory Improvement for Fiber Optics Technology Education***

Nicholas M. Massa
New England Board of Higher Education
Boston, Massachusetts 02111

ATE Project
DUE 9553762
FY1995 \$ 365,100

Title: Mathematics for Technology - Laboratory Investigators

Gary M. Simundza
Wentworth Institute of Technology
Boston, MA 02115-5998

ATE Project
DUE 9455996
FY1995-\$46,804
Mathematics

Title: Mathematics for Technology - Laboratory Investigations

Gary M. Simundza
Wentworth Institute of Tech
Boston, MA 02115-5998

ATE Project
DUE 9553704
FY1995 \$ 499,951

DRAFT

***Title: BHCC Computer Network Program: Upgrading
Microcomputer Technician Skills with a Dedicated Novell Lab***

Judith C. Oleks
Bunker Hill Community College
Boston, MA 02129

ILI Project
DUE 9551649
FY 1995 \$33,175

Hands-On Physics: A New Conception of Physics

Concord Consortium John G. King
Concord, MA 01742

ATE Project
DUE 9454575
\$432,743

Advanced Biotechnology Education Project

Barry L. Werner
Middlesex Community College
Bedford, MA 01730

ATE Project
DUE 9454642
\$347,948 (\$1,132,394)

***Math/Science Enhanced Manufacturing Technology
Training for Females and Minorities***

James Amara
Minuteman Vocational Technical School
Lexington, MA

ATE Project
DUE 9453921
\$185,700

Title: REU-Site for Biotechnolog

Bruce Jackson
Massachusetts Bay Community College
Wellesley, MA 02181-5359

BIR-9424103
FY1995 ATE \$15,000 (TOTAL \$ 40,796)
FY1996 ATE \$15,000 (TOTAL \$ 45,296)
FY1997 ATE \$15,000 (TOTAL \$ 45,296)

MICHIGAN

Title: A Fundamental Component of Engineering Technology

Gerald M. Garriot
Henry Ford Community College
Dearborn, MI 48128-2407

ILI Project
DUE 9552360
FY 1995 \$64,089
Electronics

***Title: The Southeast Michigan Alliance for Reinvestment in Technological Education
(SMARTE) Project***

Mulchand S. Rathod
Wayne State University
Detroit, MI 48202-3900

ATE Project
DUE 9553692
FY1995 \$ 149,900

Title: Establish a Chemical Engineering Technology Advanced Process Operations Program

Dr. Edward R. Fisher
Michigan Technological Univ.
Houghton, MI 49931

ATE Project
DUE-9553671
FY1995 \$499,996

A Revision of Technical Physics

Robert W. Eshelman
Henry Ford Community College
Dearborn, MI 48128

ATE Project
DUE 9454620
\$129,670

DRAFT

MINNESOTA

Establishing New Technology Education and Rural Area Networks
Minnesota Riverland Technical College (Austin Campus)
Austin, MN 55912

ATE Project
DUE 9454551
Chandler H. Stevens
\$271,802 (\$500,000)

NEBRASKA

Title: A Chemical Technology Curriculum and Materials Development Project
John V. Kenkel
Southeast Community College
Lincoln, NE 68520-1227

ATE Project
DUE 9553674
FY1995 \$ 191,590

NEW HAMPSHIRE

*Title: Defining the Emerging Role of the Technologist in a Computer-Aided
-Engineering Environment*
Robert W. Simoneau
Keene State College
Keene, NH 03435-0001

ATE Project
DUE 9553767
FY1995 \$250,000
FY1996 \$150,000
FY1997 \$148,260

NEW JERSEY

Title: New Jersey Center for Advanced Technological Education
John Bakum
Middlesex County College
Edison, NJ 08818

Center
DUE 9553749
FY1995 \$ 985,997
FY1996 \$ 982,931
FY1997 \$ 997,544

Title: Metallographic Equipment for Manufacturing Processes and Materials Laboratory
Frank J. Rubino
Middlesex Community College
Edison, NJ 08818

ILI Project
DUE 9552389
FY 1995 \$20,080
Manufacturing

Title: Automated/Instrumentated Open Channel Hydraulics Laboratory
Marshall R. Boggio
Ocean County College
Toms River, NJ 08753-2102

ILI Project
DUE 9551137
FY 1995 \$38,500
Civil Engineering Technology

*Integrating Technical Applications into Learning of Mathematics
A Collaborative Effort*
Reginald K. Luke
Middlesex County College
Edison, NJ 08818

ATE Project
DUE 9454604
\$169,813

DRAFT

NEW MEXICO

Title: Electronics Technology Curriculum Development

Brenda L. Bryan
Front Range Community Col
Westminster, CO 80030-2105

ATE Project
DUE 9553685
FY1995 \$ 301,783

NEW YORK

Title: College/Industry Telecommunications Education Partnership

Dr. Charles W. Merideth
NYC Technical College
Brooklyn, NY 11201

ATE Project
DUE-9553738
FY1995 \$196,055

***Title: Development and Implementation of Advanced
Applied Technological Mathematics***

Patrick, Alfred
SUNY Adirondack Community College
Bay Road
Glens Falls, NY 12801

ATE Project
DUE 9553765
FY1995 \$ 184,880
FY1997 \$ 49,314

Title: A Workshop Chemistry Curriculum

David K. Gosser
CUNY City College
New York, NY 10031

DUE-9455920
FY1995 ATE \$50,000 (TOTAL \$ 375,000)
FY1996 ATE \$25,000 (TOTAL \$ 375,000)
FY1997 ATE \$25,000 (TOTAL \$ 375,000)
FY1998 \$ 150,000
FY1999 \$ 150,000
Chemistry Initiative

***Title: Instrumentation to Apply the Scientific Method and
Undergraduate Environmental Science Laboratories***

James A. Collier
Truckee Meadows Community College
Sparks, NY 89512

ILI Project
DUE 9550931
FY 1995 \$20,893
Environmental Technology

Title: Mathematics and its Applications in Engineering and Sciences: Building the Links

Isiam E. Boyce
RPI
Troy, NY 12180-3590

DUE 9552465
FY1995 ATE \$125,000 (TOTAL \$ 1,185,000)
FY1996 ATE \$125,000 (TOTAL \$ 575,000)
FY1997 ATE \$125,000 (TOTAL \$ 575,000)
FY1998 ATE \$125,000 (FY1998 \$ 575,000)
(FY1999 \$ 600,000)
Math Initiative

Title: Developing a Micropropagation Training Lab

Charles B. Tarrants
SUNY Tech. Delhi
Delhi, NY 13753-1190

ILI Project
DUE 9551715
FY 1995 \$32,644
Biotechnology

DRAFT

Title: Technology Instruction for the 21st Century

Bernard E. Mohr
CUNY Queensborough Community College
New York, NY 11364

ATE Project
DUE 9454613
\$197,013 (\$500,000)

Title PACT - Partnership for the Advancement of Chemical Technology

Arlyne M. Sarquis
Miami University - Middletown
Middletown, OH 45052

ATE Project
DUE 9454518
\$400,000 (\$1,200,000)

Title National Center of Excellence for Advanced Manufacturing Education (NCE/AME)

Sinclair Community College
Dayton, OH 45402

Center
DUE 9454571
David T. Harrison
\$1,000,000 (\$3,000,000)

NORTH CAROLINA

Title: Collaborative Model for Technician Education Through Interactive Technology

J. Parker Chesson
NC St Brd of Community College
Raleigh, NC 27603-1379

ATE Project
DUE 9553709
FY1995 \$ 120,000

Title: New Technologies, Techniques and Technical Skills in the Manufacturing Economy: Reinventing Community Colleges

Stuart A. Rosenfeld
Regional Tech Strategies
Chapel Hill, NC 27514

ATE Project
DUE 9553698
FY1995 \$ 84,184

Title: Strain Gage Instrumentation for Analysis of Trusses and Other Mechanical Assemblies

Gregory Watkins
Central Piedmont Community College
Charlotte, NC 28235-5009

ILI Project
DUE 9552393
FY 1995 \$8,053
Engineering Technology

Project: Computer Technology Title: The Western Piedmont Community College Computer Enhanced Mathematics Instruction Project

Odell Witherspoon
Western Piedmont Community College
Morganton, NC 28655-4504

ILI Project
DUE 9551705
FY 1995 \$38,600
Mathematics

OHIO

Title: Advanced Technological Education Project in Environmental Technology

Jeffrey Cramer
Stark Technical College
Canton, OH 44720

ATE Project
DUE 9553768
FY1995 \$516,209

DRAFT

Title: Rapid Prototyping in Draft and Design Technology

Steven E. Wendel
Sinclair Community College
Dayton, OH 45402-1421

ILI Project
DUE 9550953
FY 1995 \$70,316
Manufacturing Technology

OREGON

Title: Northwest Center for Sustainable Resources (A National Center for Advanced Technology)

Wynn W. Cudmore
Chemeketa Community Col
Salem, OR 973097-7070

Center
DUE 9553760
FY1995 \$ 999,663
FY1996 \$ 999,553
FY1997 \$ 999,227

ATO - The Application-Based, Technology-Supported, One-Track Mathematics Curriculum Program

Mount Hood Community College
Gresham, OR 97030

ATE Project
DUE 9454627
Pamela E. Mathews
\$469,923

Advanced Technological Education Programs in Semiconductor Manufacturing

Portland Community College
Portland, OR 97219

ATE Project
DUE 9454589
David Hata
\$100,000 (\$200,000)

PENNSYLVANIA

Title: Instrumentation Laboratory for the Electro-Mechanical Engineering Technology Program

Shahriar Jahanian
Penn. State University
Altoona, PA 16603

DUE 9551289
FY 1995 \$36,893
ILI - Instrumentation

Title: Middle Atlantic Consortium for Mathematics and Its Applications Throughout the Curriculum

Dennis DeTurck
University of Pennsylvania
Philadelphia, Pennsylvania 19104-6395

DUE 9552464
FY1995 ATE \$75,000 (TOTAL \$523,206)
FY1996 \$ 599,181
FY1996 ATE \$50,000 (TOTAL \$ 449,653)
FY1998 \$ 499,653
Mathematical Sciences

Title: Activity Based Physics: Curricula, Computer Tools, and Apparatus for Introductory Physics Courses

Priscilla W. Laws
Dickinson College
Carlisle, PA 17013

DUE 9455561
FY1995 ATE \$75,000 (TOTAL \$ 650,000)
FY1996 \$ 525,000
FY1997 \$ 525,000
Course and Curriculum - Physics

DRAFT

A Partnership for Excellence in Engineering Technology Education
Pennsylvania State University - University Park
University Park, PA 16801

ATE Project
DUE 9454547
Wayne R. Hager
\$282,000 (\$658,000)

SOUTH CAROLINA

Title: The South Carolina Advanced Technological Education (SC ATE) Exemplary Faculty Project ATE Project
Lynn Mack DUE 9553740
Piedmont Tech College FY1995 \$ 486,930
Greenwood, SC 29646 FY1996 \$ 487,297
FY1997 \$ 482,379

Title: Integrating a New Vision in Environmental Sciences Technology (INVEST)

Ms. Catherine Almquist
Trident Technical College
Department of Physical Sciences
Charleston, SC 29423

Proposal: DUE-9553696
FY1995 \$250,647
Advanced Technological Education

Establishment of an Instrumentation Calibration Laboratory

Piedmont Technical College
Greenwood, SC 29646

ATE Project
DUE 9454536
Ron Ingle
\$123,904

TENNESSEE

Title: Community College Science Connection Conference

Alfred Wohlpart
Oak Ridge Associated University
Oak Ridge, TN 37831-0117

DUE-9552954
FY1995 \$ 40,000

*Curriculum and Pedagogy Standards for Two-Year College
and Lower Division Mathematics*

AMATYC
Memphis, TN 38134

ATE Project
DUE 9443721
Marilyn Mays
\$10,200

TEXAS

Title: Foundation Skills for Advanced Technology

Stephen B. Rodi
Austin Community College
Austin, TX 78768-2285

ATE Project
DUE 9553689
FY1995 \$ 318,715

DRAFT

Title: Regional Center of Excellence for Precision Manufacturing Technologies

Wayne Wells
Rio Grande Center for Manufacturing
Edinburg, TX 78539

DUE-9553701
FY1995 \$100,340

Title: Digital Imaging Laboratory Development Program

Bobby Hoyle
Texas Technical Institute, Harlingen
Harlingen, TX 78550

ATE Project
DUE 9553741
FY1995 \$ 100,000

Title: Laboratory Development For Microelectronics Technology

Jenna L. Ware
Texas State College - Sweetwater
Sweetwater, TX 79556-9803

DUE 9552265
FY 1995 \$59,602
ILI - Instrumentation
Project: Electronics

Title: The Two-Year College in the Twenty-First Century: Breaking Down Barriers

Mary Monroe
Southwest Texas Jr College
Uvalde, TX 78801

DUE-9450160
FY1994 \$208,348
FY1996 \$358,975
FY1997 \$360,125
FY1998 \$257,957

Title: Machine Tool Advanced Skills Technology Educational Resources (MASTER) Program

John D. Pierson
Texas St Tech Institute Waco
Waco, TX 76705

ATE Project
DUE 9553716
FY1995 \$ 550,000
FY1996 \$ 500,000
FY1997 \$ 500,000

Interactive Multimedia Instruction for Advanced Instrumentation Technology

Alvin Community College DUE 9454508
Alvin, TX 77511

Project
Kenneth Sweeney
\$247,823

Technical Sciences Academy Proposal

Amarillo College
Amarillo, TX 79178

ATE Project
DUE 9454651
Therese A. Jones
\$630,000

Advanced Technical Education (ATE) Alliance

Consortium for Advanced Manufacturing International
Arlington, TX 76011

ATE Project
DUE 9454655
James A. Jordan
\$499,950 (\$1,499,850)

Title: Young Scholars Program

Jerry J. Brand
Univ. of Texas Austin
Austin, TX 78712-9998

ESIE-9452693
FY1995 \$ 60,975
Young Scholars Program

A Consortium for the Development of Advanced Manufacturing Education

Houston Community College
Houston, TX 77270

ATE Project
DUE 9454569
Bartlett M. Sheinberg
\$304,000 (\$604,000)

DRAFT

Southwest Center for Advanced Technological Education
Texas State Technical Institution at Sweetwater
Sweetwater, TX 79556

Center
DUE 9454643
Robert L. Musgrove
\$565,872 (\$1,711,637)

VIRGINIA

Title: High Quality Biotechnology Education
Kathleen Frame
National Association of Biology Teachers
Reston, VA 22090

ATE Project
DUE 9553720
FY1995 \$ 499,239

A Model Rural Appalachian Partnership to Improve Technology Education through Faculty Enhancement and Curriculum Development Activities
Wytheville Community College
Wytheville, VA 24382

ATE Project
DUE 9454577
Gary T. Laing
\$197,873

WASHINGTON D.C.

Title: Preparation of Technicians for the Biotechnology Industry
Jack G. Chirikjian
Georgetown University
Washington, DC 20007-2197

ATE Project
DUE 9553661
FY1995 \$ 250,000

Title: Expanding the Network of Community Colleges in Advanced Science and Engineering Technology Education
James Mahoney
American Association of Community Colleges
Washington, DC 20036-1176

DUE 9552975
FY1995 \$237,320

Science Technology: Knowledge and Skills
American Chemical Society
Washington, DC 20036

ATE Project
DUE 9454564
David K. Lavalley
\$500,000 (\$1,500,000)

WASHINGTON

Title: Northwest Center for Emerging Technologies: New Designs for Advanced Technological Education
Douglas N. Brown
Bellevue Community College
Bellevue, WA 98009-2037

Center
DUE-9553727
FY1995 \$999,737
FY1996 \$992,386
FY1997 \$999,931

DRAFT

Title: Advanced Technology Curriculum: Meeting AEA Standards
Andrew Woodson
North Seattle Community College
Seattle, WA 98103-3599

ATE Project
DUE 9553726
FY1995 \$300,000
FY1996 \$300,000

WISCONSIN

Title: ChemLinks Coalition: Making Chemical Connections
Brock Spencer
Beloit College
Beloit, WI 53511

DUE-9455918
FY1995 ATE \$100,000 (TOTAL \$ 605,000)
FY1996 ATE \$50,000 (TOTAL \$ 605,000)
FY1997 ATE \$50,000 (TOTAL \$ 605,000)
FY1998 \$ 350,000
FY1999 \$ 350,000
Course and Curriculum Program

Title: Advanced Dimensional Metrology and ISO9001 Educational Partnership Program
Robert L. Brown
Madison Area Tech College
Madison, WI 53703-2285

ATE Project
DUE 9553684
FY1995 \$ 155,036

An Advanced Biotechnology Education Partnership Program
Madison Area Technical College
Madison, WI 53703

ATE Project
DUE 9454555
Joy A. McMillan
\$400,000 (1,000,000)

Title: Establishing New Traditions: Revitalizing the Curriculum
John W. Moore
University of Wisconsin-Madison
Madison, WI 53706

DUE-9455928
FY1995 ATE \$100,000 (TOTAL \$849,968)
FY1996 ATE \$50,000 (TOTAL \$849,999)
FY1997 ATE \$50,000 (TOTAL \$849,941)
FY1998 \$499,941
FY1999 \$499,742
Chemistry Initiative

WYOMING

Title: Math Projects - Inter-disciplinary Education Applications Through Industry Partnerships And Industry - based Project (MP-IDEA)
Peter Wildman
Casper College
Casper, WY 82601-4612

DUE 9552273
FY 1995 \$15,547
ILI - Instrumentation
Project: Mathematics