

**NSF Opportunities for Two-Year College Mathematics Programs**

*American Mathematical Association of Two-Year College  
28<sup>th</sup> Annual Conference, Phoenix Arizona  
Friday November 15, 2002,  
9:30 am - 10:30 am*

Elizabeth Teles,  
Acting Division Director, Division of Undergraduate Education  
Lead Program Director, Advanced Technological Education (ATE)  
Division of Undergraduate Education

**How Much did Community Colleges Receive in 2002 from NSF?**

- \$66 Million
  - \$38 million ATE
  - \$8 million CSEMS
  - \$1 million CCLI
  - \$1 million STEP
  - \$11 TCUP
  - \$7 million other programs combined
- We need to increase the amounts, particularly in the CCLI program.
- FY 2003, STEP and ATE may get increased funding.



National Science Foundation  
Division of Undergraduate Education

**Programs in DUE**

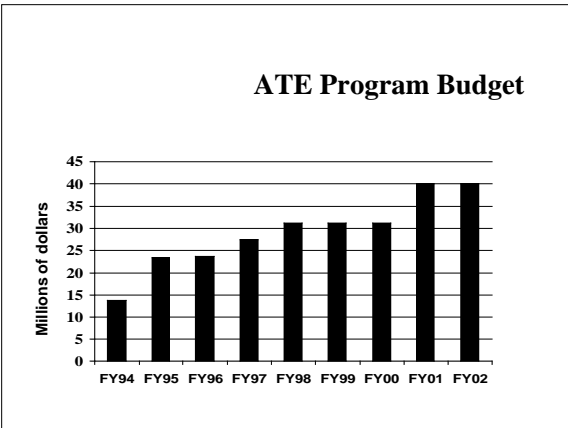
- Advanced Technological Education (ATE)
- Course, Curriculum, and Laboratory Improvement (CCLI)
- National Science, Mathematics, Engineering, and Technological Education Digital Library (NSDL)
- Computer Science, Engineering, and Mathematics Scholarship (CSEMS)
- Federal Cyber Service : Scholarship for Service (SFS)
- NSF Director's Award for Distinguished Teaching Scholars (DTS)
- Assessment of Student Achievement (ASA) in Undergraduate Education
- Science, Technology, Engineering, and Mathematics Teacher Preparation (STEMTP)
- STEM Talent Expansion Program (STEP)

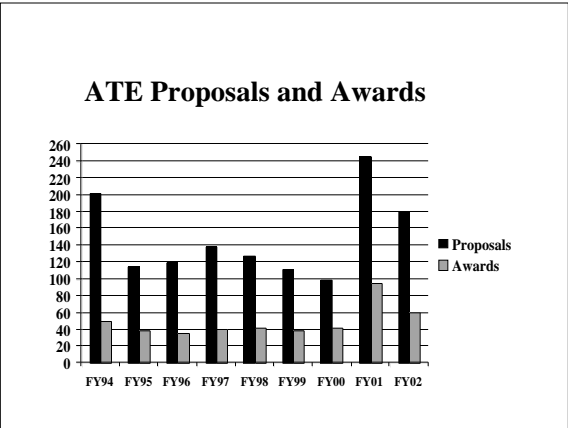
**Division of Undergraduate Education  
Anticipated Closing Dates FY 03**

- **Course, Curriculum, and Laboratory Improvement (CCLI)**
  - EMD and ND June, 2003
  - A & I December 4, 2002
  - December, 2003
- **Advanced Technological Education (ATE)**
  - Preliminary Proposals April, 2003
  - Formal Proposals October, 2003
  - Science, Technology, Engineering, and Mathematics Talent Expansion Program TBD (June, 2003?)
- **Computer Science, Engineering, and Mathematics Scholarships (CSEMS)** February 5, 2003

**ADVANCED  
TECHNOLOGICAL  
EDUCATION**

<http://www.ehr.nsf.gov/ehr/DUE/programs/ate/>





### Foci of ATE Awards

	1996-2000	2001
Biotechnology	18	6
Chemical Technology	13	2
Multidisciplinary	21	9
Electronics	10	2
Other Engineering Technology	23	7
Environmental	18	4
Geographic Information Systems	10	3
Manufacturing	26	16
Math/Physics	18	7
Telecommunications	9	2
Computer/Information Systems	30	21
Marine/Agriculture/Aquaculture	5	6
Teacher Preparation	n/a	10
<b>Totals</b>	<b>201</b>	<b>95</b>

### ATE Awards 2002

Type Award	Range	Duration	#
1. Projects	\$25 K to \$900 K	1 to 3 years	42
2. National Centers	\$2.5 M to \$3 M	3 Years	3
3. Regional Centers	\$1.5 M to \$2 M	3 Years	2
4. Planning Grants	\$40 K to \$50 K	1 to 2 Years	5
5. Articulation Partnerships	\$100 K to \$300 K	3 Years	7

### Impact Data on Students in Associate Degree Institutions - 47 Projects and Centers

ATE Degree or Certificate Programs at Associate Degree Institutions	Average Numbers Per Project/Center	Total Numbers for 47 Projects Reporting
Number of Institutions and Campuses Where ATE Impacted Programs are Offered	10	470
Total Number of Courses Impacted Across all Programs and Locations	73	3431
Number of Students who Have Taken at Least One ATE Impacted Course in Past Year	2297	107,959

### Gender and Ethnicity of Students Enrolled in ATE Courses in Associate Degree Institutions -- 47 Projects and Centers Responding \*

- **Gender**
  - Females 28%
  - Males 72%
- **Ethnicity**
  - Hispanic or Latino 16%
  - American Indian or Alaska Native 7%
  - Asian 8%
  - Black or African American 15%
  - Hawaiian or Other Pacific Islander 3%
  - White 47%
  - Unknown 4%

\*These are averages of percents provided by the individual projects.

- ### Advanced Technological Education (ATE)
- Assures that students acquire appropriate backgrounds in mathematics and science
  - Supports development of science and engineering technology programs and courses with the assumption that students have appropriate backgrounds
  - Works on partnerships among 2-year colleges, secondary schools, 4-year colleges and universities, business, industry, and government
- <http://www.ehr.nsf.gov/ehr/DUE/programs/ate/>

### Advanced Technological Education Programs

- **Projects** which focus on one or more aspects of:
  - Curriculum and Educational Material Development (for National Dissemination);
  - Program Improvement;
  - Professional Development for Educators (focus on community college and secondary);
  - Technical Experiences; or
  - Laboratory Development.
- **Articulation Partnerships**
  - Teacher Preparation
  - Associate Degree and Bachelor Degree Programs
- **Centers**
  - Regional Centers in Information Technology and/or Manufacturing
  - National Centers of Excellence
  - Resource Centers
  - Planning Grants

### Integrated Mathematics and Physics for Technical Programs



Wake Technical Community College  
P.I.: Robert Kimball  
Award : \$ 119,999

DUE 9752038  
ATE Project

- Integrating mathematics and physics to
  - (a) strengthen students' skills at applying mathematical concepts and
  - (b) better prepare students for highly technical workplaces.
- Using physical models to motivate study of mathematics.
- Teaching students to work collaboratively, use technology, communicate, and problem solve.

### Math Applications Shaping Tomorrow (MAST)



Northern Essex Community College  
P.I.: Catherine Pirri  
Award : \$ 243,724

DUE 0202133  
ATE Project

- Partnering with local industry to incorporate problem solving and real industry-based applications into mathematics curriculum at 3 levels (high school, 2-yr college, 4-year colleges and universities).
- Incorporating technology as both a teaching and learning tool and fostering an interactive environment.
- Providing extensive faculty professional development opportunities.
- Adapting materials from Greenville Technical College

### Technical Mathematics for Tomorrow Recommendations and Exemplary Program



AMATYC  
P.I.: Mary Ann Hovis  
Award : \$ 269,956

DUE 0003065  
ATE Project

- Analyzing the role and nature of technical mathematics in advanced technology programs
- Recognizing successful models
- Developing a vision and recommendations for the future
- Bringing together mathematics and technical program faculty together with business and industry to address content and curriculum issues

### Industrial Biotechnology Instruction: A Modular Approach



Moorpark College - California

- Addresses a critical need for a skilled workforce in biomanufacturing
- Industry, community colleges, and universities are developing a model curriculum focusing on 8 modules designed after the departments of a manufacturing facility
- Uses scientists from industry as instructors for the modules

### Native American Environmental Technology Program



Northwest Indian College - Washington State

- Working with four-year institutions to ensure transferability and other ATE and NSF projects to Mesa State and Navajo Community College
- Using methods that support Native American learning styles including hands-on learning, emphasis on speaking and writing skills, group projects, multidisciplinary courses, and internships
- Developing and testing an advanced technical environmental technology program which meets the critical need to increase the number of Native Americans working within tribal natural resource and environmental management programs



## ATE National Centers of Excellence

- Usually in a disciplinary field (e.g., Manufacturing, Telecommunications, Biotechnology)
- National resource for the particular technology
- Involve many activities
  - standard setting
  - curriculum development
  - faculty and teacher enhancement
  - dissemination of the Center's and others' material
  - facilitating partnerships among other schools and colleges
  - recruitment and retention strategies

### ATE PROGRAM - Centers for Excellence

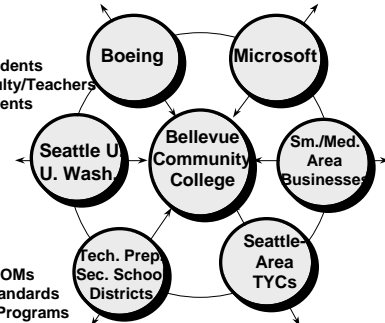
#### NWCET

##### DIRECT IMPACT:

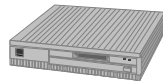
- 5000 ATE Students
- 350 ATE Faculty/Teachers
- 2700 HS Students

##### NATIONAL PRODUCTS:

- Textbooks
- Software/CD-ROMs
- Articulation Standards
- Model Degree Programs



### Maricopa Advanced Technology Education Center



Maricopa County Community College District - Arizona

- Partnering with 10 semiconductor manufacturing firms including Intel, Motorola, SGS-Thompson, and Microchip Technology
- Developing curricular systems and materials to support needs for technicians in semiconductor manufacturing
- Providing technical and instructional support for teachers and faculty
- A collaboration between 2- and 4-year colleges, universities, industry, Tech Prep consortia, and the Phoenix Urban Systemic Initiative
- Increasing the number of students, especially women and minorities, preparing for technician careers

## Regional Centers



- Manufacturing Technology or Information Technology
- Regional focus – serves the needs of industry in a region
- Collaboration among colleges and secondary schools
- Collaboration with industry in the region
- Activities include curriculum adaptation, faculty and teacher development, establishment of partnerships, and recruitment and retention strategies, all directed toward regional workforce needs
- Clear, measurable impacts on quantity and quality of students for the workforce

## Kentucky Information Technology Center

Kentucky Community and Technical Colleges  
Lexington Community College



- Increasing Information Technology (IT) enrollment and completion rates of students in two-year colleges
- Implementing an industry-driven IT curriculum
- Providing professional development for high school and two-year college faculty using a physical facility, a virtual center, and mobile centers to provide workshops
- Increasing support and participation of business, government, and industry



## Articulation Between Associate's Degree and Bachelor's Degree Programs

- Bridge courses or programs
- Innovative (articulated) curricula or reengineering educational pathways
- Contextualizing mathematics or science in technical courses and vice versa
- Professional development workshops and faculty exchanges for 2-yr and 4-yr college faculty to jointly design and implement new courses
- Effective marketing of degree programs and career opportunities.

### *Investing in Tomorrow's Teachers*

Two-year colleges should collaborate with four-year institutions and school systems to:

- Coordinate advising for prospective teachers
- Eliminate barriers for course transferability by articulating transfer agreements
- Design and implement high-quality STEM curricula
- Engage potential teachers in preK-12 tutoring, mentoring, and enrichment programs in STEM fields



### **Teacher Preparation in Two-Year Colleges**

All proposals must involve 2 and 4-year institutions and should aim to:

- Increase number, quality, and diversity of prospective K-12 teachers in preprofessional programs in two-year colleges.
- Improve technological literacy of prospective K-12 teachers at all levels and their understanding of the modern workplace.
- Strengthen prospective K-12 teachers' preparation in mathematics and science.

### *ATE Teacher Preparation Track*

Projects should focus on activities such as:

- Recruiting students into careers as STEM teachers
- Establishing or enhancing the infrastructure of 2-yr college programs for prospective teachers
- Developing or adapting high quality, STEM materials, courses, and methods for 2-yr college courses for prospective teachers with emphasis on technological literacy
- Engaging pre- and in-service teachers in joint activities
- Connecting 2-yr college programs for prospective teachers with business and industry, etc.

### *Maryland Articulation Partnership for Teachers*



Prince George's Community College  
P.I.: Patricia A. Basill  
Award: \$257,541

DUE 0101524  
ATE Teacher Preparation Articulation Partnership

- The Partnership is designed to develop and implement science and mathematics courses for preservice elementary teachers in Maryland's community colleges.
- Courses are modeled after courses developed through the Maryland Collaborative for Teacher Preparation and conform to a constructivist and inquiry-based approach.
- The science and mathematics course development is part of a larger effort to establish an Associate of Arts degree in teaching in Maryland community colleges that articulates with all four year institutions in the state.

### *Project TEAMS - Teachers Education Alliance for Math and Science*



Lee College  
P.I.: Brian C. Hale  
Award: \$280,248

DUE 0101722  
ATE Teacher Preparation Articulation Partnership

- Project outcomes include:
  - New interdisciplinary courses
  - A series of Saturday Labs taught by community college and university faculty
  - Preservice/in-service teams designing experiments geared for fourth and fifth grade students and conducting the activities in the partner schools through a Traveling Lab
  - Prospective teachers providing classroom assistance to fourth and fifth grade mentor teachers in science and math

### **Preparing Tomorrow's Science and Mathematics Teachers: The Community College Response**

**PTK**

Phi Theta Kappa Headquarters  
P.I.: Diane U. Eisenberg  
Award: \$400,000

DUE 0101567  
ATE Project

- Uses proven mentoring activities that extend the knowledge, experience and materials achieved by 7 community college teacher preparation programs --first to 18 competitively selected community colleges, and by extensive dissemination activities, to community, technical, and junior colleges nationwide.
- Includes a national competition to select 18 colleges, 2 National Teacher Preparation Conferences, a periodic newsletter, a case study monograph, and a broad range of other dissemination activities through Phi Theta Kappa and the American Association of Community Colleges (AACC).

## Science, Technology, Engineering, and Mathematics Teacher Preparation (STEMTP)

Division of Undergraduate Education  
NSF Directorate for Education and Human Resources  
<http://www.ehr.nsf.gov/ehr/DUE/programs/stemtp/>

## STEMTP Goals

*To produce teachers who are able to:*

- Engage their students in the use of technology in instruction and learning as well as in the practice of science and mathematics
- Understand research on learning and use research methodologies to augment and guide their own instructional practices
- Address the varied learning styles, cultural and experiential backgrounds, and the unique needs of individual students

## STEMTP Focus Areas

- Exemplary baccalaureate and five-year degree programs for preK-12 teachers of mathematics and science
- Model alternative certification programs for individuals with STEM degrees to facilitate entry into the preK-12 mathematics and science teaching profession

## Features of Projects

Strategies for ensuring preservice students acquire:

- Deep content knowledge
- Pedagogical skills
- Knowledge of preK-12 mathematics, science and technology standards
- Knowledge of variety of student assessment techniques and use of assessment to guide teaching and learning
- Awareness of equity issues and needs of diverse learners
- Knowledge of the research basis for effective teaching

## Features of Projects

- Partnerships involving STEM faculty, education faculty, and school districts
- Include two-year colleges
- Recruitment of prospective teachers from groups underrepresented in the teacher workforce
- Recruitment of STEM majors
- Linked to induction programs for novice teachers
- Evaluation design

## Computer Science, Engineering, and Mathematics Scholarships (CSEMS)

The CSEMS Program provides institutional awards for student scholarships of up to \$3125 per year to encourage and enable the achievement of higher education degrees in computer science, computer technology, engineering, engineering technology, or mathematics by talented but financially disadvantaged students.

February 5, 2003

<http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf03501>

***The expected goals include:***

- Increased numbers of well-educated and skilled employees in technical areas of national need
- Improved education for students in the targeted disciplines
- Increased retention to degree achievement; and
- Strengthened partnerships between institutions of higher education and local high technology industry

**Eligibility Criteria for CSEMS Recipients:**

- United States' citizen, nationals, permanent resident aliens, or aliens admitted as refugees
- Financial need as defined by U.S. Department of Education rules for Federal financial aid
- Academic potential or ability
- Full time enrollment in computer science, computer technology, engineering, engineering technology, and/or mathematics degree programs at the associate, baccalaureate, or graduate level

***Computer Science, Engineering, and Mathematics Scholars***



Contra Costa Community College  
PI: Martin

DUE 0092637  
CSEMS \$ 270,000

- Provides scholarships to low-income, academically talented students
- Facilitates successful graduation of students with associate degrees and transfer to four-year college or university by providing scholarship for sophomore year at a community college and junior year at a four-year institution
- Supports students through mentoring, academic workshops, tutoring, internship opportunities, leadership development, scientific seminars, and field trips

**Using Computer Science, Engineering, and Mathematics Scholarships to Build Information Technology Resources**

College of DuPage  
PI: Capetta

DUE 9986956  
CSEMS \$219,874

- Expands and improves learning opportunities for students enrolled in CSEM
- Increases retention to associate degree achievement
- Improves placement in baccalaureate programs
- Expands partnerships with employment sector
- Implements recruitment strategies for groups underrepresented in CSEM.
- Targets both high school and adult learners



**Course, Curriculum, and Laboratory Improvement ( CCLI ) Program**

**Goal:** To revitalize and improve the quality of STEM undergraduate education obtained by all students at all types of institutions.

**Tracks:**

- Educational Materials Development ( EMD )
  - Proof of Concept
  - Coalition Proof of Concept
  - Full Development
- Adaptation and Implementation ( A&I )
- National Dissemination ( ND )





**Improving Student Learning in Calculus Through Effective Implementation of Model Activities**

Gadsden State Community College DUE 9950763  
 PI: Mary Ann Misko CCLI A&I  
 Award: \$87,185

- Collaboration with U of Alabama & Duke U to create an effective learning atmosphere for students
- Addresses three problems: limited lab facilities; low student success rates in Calculus I; low persistence rates in calculus series
- Targets women, minorities, math education majors
- Partnership with local magnet high school and two universities for professional development of high school and college faculty

**Coalitions of Two- and Four- Year Institutions ( New EMD emphasis )**



- Initial coalition “ Proof of Concept” proposals
- Encourages **joint** projects in STEM disciplines from coalitions of two- and four- year institutions
- Proposals must involve **BOTH** two- and four-year faculty in the **design , development , and implementation** activities
- An **additional** \$25K may be requested ( \$100K total)



**Interactive Software to Improve Student Success in Developmental Mathematics**

Bunker Hill Community College DUE9950568  
 PI: Joanne Manville CCLI EMD Award: \$107,246

- ▲ Materials development to address problem and perception of mathematics as memorization of formulas
- ▲ Student success strategies incorporated into the model
- ▲ Producing companion instructors’ resource guide and a series of “Success in Mathematics” modules
- ▲ Collaboration with MA College of Art

**STEP (STEM Talent Expansion Program)**



Seeks to increase the number of students (U.S. citizens or permanent residents) pursuing and receiving associates or baccalaureate degrees in established or emerging fields within science, technology, engineering, and mathematics (STEM).

<http://www.ehr.nsf.gov/ehr/DUE/programs/step/>  
 June, 2003

**STEP**



- Planning and pilot efforts in FY02
- One proposal per institution
- \$5 million available in FY02
- Budgetary Limitations
  - \$100 K for up to 5,000 undergrad students
  - \$250 K for 5,000-15,000 undergrad students
  - \$700 K for >15,000 undergrad students

**STEP**



*Efforts might include:*

- > Bridge programs that enable additional preparation for students
- > Programs that focus on the quality of student learning
  - > high-caliber teaching in smaller classes
  - > new pedagogical approaches
  - > training of teaching assistants
- > Programs to encourage undergraduate research
- > Programs that provide financial incentives to students
- > Many others

*Partners to Attract and Sustain Adult Learners (PASAL)  
Naugatuck Valley Community College*

- Helping the 1100 current STEM students at the college.
- Attracting students from the large pool of General Studies and Continuing Education programs.
- Expanding number and level of industry partners.
- Exposing students to STEM careers, using Web materials.
- Improving mathematics by emphasizing mathematical applications.
- Using an Early Alert service to proactively identify, support, and help students who show early signs of difficulties.

*Planning and Assessing Student Achievement in Mathematics – Gateway to STEM and Careers (PASS Math)*

*Penn Valley Community College*

- Focuses on reviewing and revising developmental and technical mathematics to increase the pool of students interested in STEM careers.
- Assumes that students' success in mathematics increases when they relate math to other disciplines.
- Creates a significant increase in students transitioning from developmental mathematics to successful completion of college-level mathematics.
- Doubles the number of students who enroll in STEM programs.



**WHAT MAKES A GOOD PROJECT?**



- ▲ INNOVATIVE
- ▲ REALISTIC
- ▲ WORTHWHILE
- ▲ WELL-PLANNED

**The Proposal:  
Criteria for Evaluation**



- Peer Reviewed
- Criteria for Evaluation
  - What is the intellectual merit of the proposed activity?
  - What are the broader impacts of the proposed activity?

**Intellectual Merit**

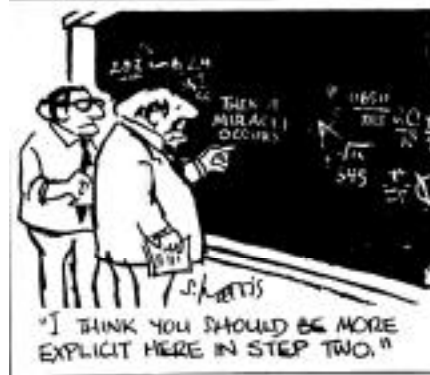


- Addresses a major challenge
- Supported by capable faculty and others
- Improved student learning
- Rationale and vision clearly articulated
- Informed by other projects
- Effective evaluation and dissemination
- Adequate facilities, resources, and commitment
- Institutional and departmental commitment

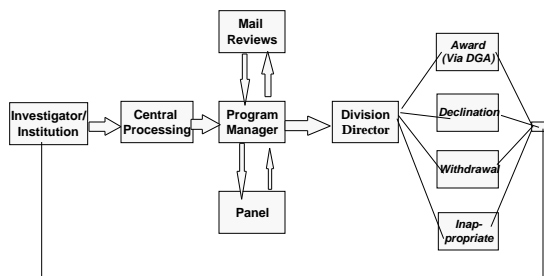
## Broader Impacts



- Integrated into the institution's academic programs
- Contributes to knowledge base and useful to other institutions
- Widely used products which can be disseminated through commercial and other channels
- Improved content and pedagogy for faculty and teachers
- Increased participation by women, underrepresented minorities, and persons with disabilities
- Ensures high quality SMET education for people pursuing careers in SMET fields or as teachers or technicians



## NSF Proposal Review and Decision Process



## WAYS TO PARTICIPATE

- **Grant Holder**
  - Principal Investigator
  - Member of Project Team
  - Member of a coalition
  - Member of an Advisory Board
  - Test Site
- **User of Products**
- **Participant in Workshops and Symposium**
- **Reviewer of Proposals**



## FastLane Functions

- Prepare and submit proposals
- Prepare and submit project reports (annual, final, interim)
- Check proposal status
- View reviews of proposal
- Prepare and submit post-award notifications and requests
- Prepare and submit reviews

Phone: 1-800-673-6188

*(continued)*  
<https://www.fastlane.nsf.gov/fastlane.jsp>

## Information and Inquiries

- **DUE Information System**
  - Email [undergrad@nsf.gov](mailto:undergrad@nsf.gov)
  - Phone 703-292-8670
  - Fax 703-292-9015
- **DUE Web Site**  
<http://www.ehr.nsf.gov/EHR/DUE/>
- **DUE Project Information Resource System**  
<http://www.ehr.nsf.gov/PIRSWeb/Search/>
- **DUE Mailing Address**
  - NSF, Division of Undergraduate Education, 4201 Wilson Boulevard, Room 835, Arlington, VA 22230



***Bye for Now. Hope to Hear  
From You Soon. NSF needs all  
of you. You may need NSF!!***

