

**A Vision for Technical  
Mathematics –  
A project of AMATYC with  
support from the NSF**

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**Technology Programs in  
Two-Year Colleges**

Traditional	Emerging
Electronics	Telecommunications
Civil/Surveying	Biotechnology
Manufacturing	Computerized Manuf.
Chemical	Semiconductors
Computer	Information Technology

**Question**

Is the math that was  
traditionally taught to the  
technical programs in two-year  
colleges appropriate for the  
emerging technologies?

**Mathematical Association  
of America (MAA)**

**Calculus Reform and the  
First Two Years (CRAFTY)**

Holding discipline-specific workshops to ask  
others what they require of students in the  
way of mathematics.

**1998-2000**

## Proposed Timeline

- May, 2000** Funding Secured from NSF
- Summer, 2000** Select Participants for the two disciplinary workshops (CRAFTY)
- October, 2000** Hold CRAFTY workshops in LA and Richmond
- Spring, 2001** Write reports from the October meetings and select participants for a National Conference

continued

## CRAFTY Reports

- Mathematics
- Mathematics education
- Computer science
- Statistics
- Business
- Life Sciences
- Physics
- Civil engineering
- Mechanical engineering
- Chemical engineering
- Electrical engineering
- Chemistry
- Biology
- Interdisciplinary

## 2 Regional “CRAFTY” Workshops

- Los Angeles Pierce College, October 5–8, 2000
- J. Sargeant Reynolds Community College, October 12–15, 2000

## Los Angeles Pierce College, October 5–8, 2000



## J. Sargeant Reynolds Com. Col. October 12–15, 2000



## CRAFTY Workshops

- Focused on mathematics needed in advanced technology A.A.S. programs
- Representatives from
  - Technical faculty at two-year colleges
  - Industry
  - Four year colleges
  - Professional associations

## CRAFTY Workshops

### Fields represented

- Biotechnology, Environmental Technology
- Electronics Engineering Technology, Telecommunications, and Semiconductors
- Information Technology
- Manufacturing, Mechanical Engineering Technology

## Ten Exemplary Programs

- |  |  |
|--|--|
| • Bellevue Community College, Bellevue, WA                     | • Frederick Community College, Frederick, MD         |
| • British Columbia Institute of Technology (BCIT), Burnaby, BC | • Hudson Valley Community College, Troy, NY          |
| • Delaware Technical & Community College, Newark, DE           | • Madison Area Technical College, Madison, WI        |
| • Dutchess Community College, Poughkeepsie, NY                 | • Oklahoma City Community College, Oklahoma City, OK |
| • Edison State Community College, Piqua, OH                    | • Wake Technical Community College, Raleigh, NC      |

## National Conference to create a Vision for Technical Math

Las Vegas  
May 12–15, 2002

83 participants

## Las Vegas Conference

16	40	16
Participants from selected Exemplary Programs	Participants from Two- Year College Mathematics Programs	Participants from the Emerging Technologies
National Advisory Committee & Guests		

## Results

- Content
- Pedagogy and Classroom Environment
- Delivery
- Currency
- Successful Programs
- Other Recommendations

## Content

Critical Thinking – Problem Solving –  
Communicating Mathematically

Arithmetic	Geometry
Algebra	Statistics
Trigonometry	Calculus

## Content

Problem Solving

- Select appropriate method for solving
- Require research
- Students select process
- Collect data
- Use technology to organize and analyze data

## Content

Communicating Mathematically

- Give both oral presentations and written reports
- Able to use the “Rule of 4”
- Use appropriate visuals

## Content

### Algebra

- Modeling with functions
- Plot data and analyze graphs
- Interpolate and extrapolate using model
- Discuss possible limitations of model

## Content

### Statistics

- All students need some
- Measures of central tendency and variance
- Correlation
- SPC
- Hypothesis testing:  $t$ -test,  $\chi^2$  ANOVA

## Pedagogy

The Learners  
Technology  
The Internet  
Teaching & Learning Methods  
Outside Contributors

## Pedagogy

- The Learners: Androgogy not pedagogy
- Why they need to learn something
  - Responsible for own lives
  - Greater vol. and diff. quality of experiences
  - Ready to learn
  - Life (task, problem) centered toward learning
  - Intrinsic motivators rather than extrinsic

## Pedagogy

- Technology
- A tool; doesn't drive curriculum
  - Tech. training avail to both adj and full
  - Calculators or computers
  - CAS
  - Allows use of realistic data

## Pedagogy

- The Internet
- Facilitates research activities
  - Helps teach how to use reference materials
  - Helps with prob. solving process
  - Web sites do not always have correct data

## **Pedagogy**

### Teaching & Learning Methods

- Use student-centered methods:
  - ❖ Computer simulation
  - ❖ Web-assisted activities
  - ❖ Instructional television
- Collaborative techniques

## **Resources**

### Physical Resources

- Classroom Environment and Equipment
- Classroom Management Systems
- Textbooks

### Human Resources

- Learning Communities
- Adjuncts

## **Resources**

### Physical Resources

- Classroom Environment and Equipment
  - Wireless
  - Appropriate furniture
  - Smart boards
  - Projection units

## **Resources**

### Physical Resources

- Classroom Management Systems
  - WebCT
  - Blackboard
  - Chat rooms

## **Resources**

### Physical Resources

- Textbooks
  - If the books don't change; many teachers will not change

## **Keeping Current**

### **Professional Development**

- Have an institutional commitment
- Available to adjuncts and full-time faculty
- Influence instructor evaluation
- Support for faculty release time

## Keeping Current

### Individuals

- Read!
- Attend conferences and workshops
- Share findings
- Industry exchange

## Maintaining a Successful Program

Attitude about mathematics

Partnerships

Technology Faculty

Business and Industry

High Schools

Articulation

Community Involvement

## Other Recommendations

- Determine how to institutionalize change
- National clearinghouse
- Internet sharing
- Technical mathematics journal
- Promote transferability
- Assess reform efforts
- Connect with industry

## Vision Distribution

Complete document: All AMATYC members and TYC math dept heads

Executive Summary: All TYC presidents

## Further Information is at the Project Web Site

<http://www.waketech.edu/~rlkimbal/CRAFTY/>

### CRAFTY disciplinary reports:

[http://academic.bowdoin.edu/faculty/B/barker/dissemination/Curriculum\\_Foundations/](http://academic.bowdoin.edu/faculty/B/barker/dissemination/Curriculum_Foundations/)