

Barrier Busters!

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National Alliance for
Partnerships in Equity



Why Do We Need to Encourage Students to Study Science & Engineering?

- In the last 50 years, more than half of America's sustained economic growth was fueled by engineers, scientists and advanced-degree technologists, a mere 5% of America's 132 million-person workforce. (1)
- Twenty-five percent of our scientists and engineers will reach retirement age by 2010. (1)
- By the year 2050, 85% of the entrants into the workforce will be people of color and women. (2) In 2003, women were 26.1% of all STEM occupations. In 2004, African Americans and Hispanics were 6.2% and 5.3% of all STEM occupations respectively. (3)
- The National Bureau of Labor Statistics projects that our greatest needs will be in computer-related fields that propel innovation across the economy. (1) Female bachelors degree recipients dropped from 37% in 1985 to 27% in 2003. (2)

Why Do We Care if Women and Minorities Become Engineers and Scientists?

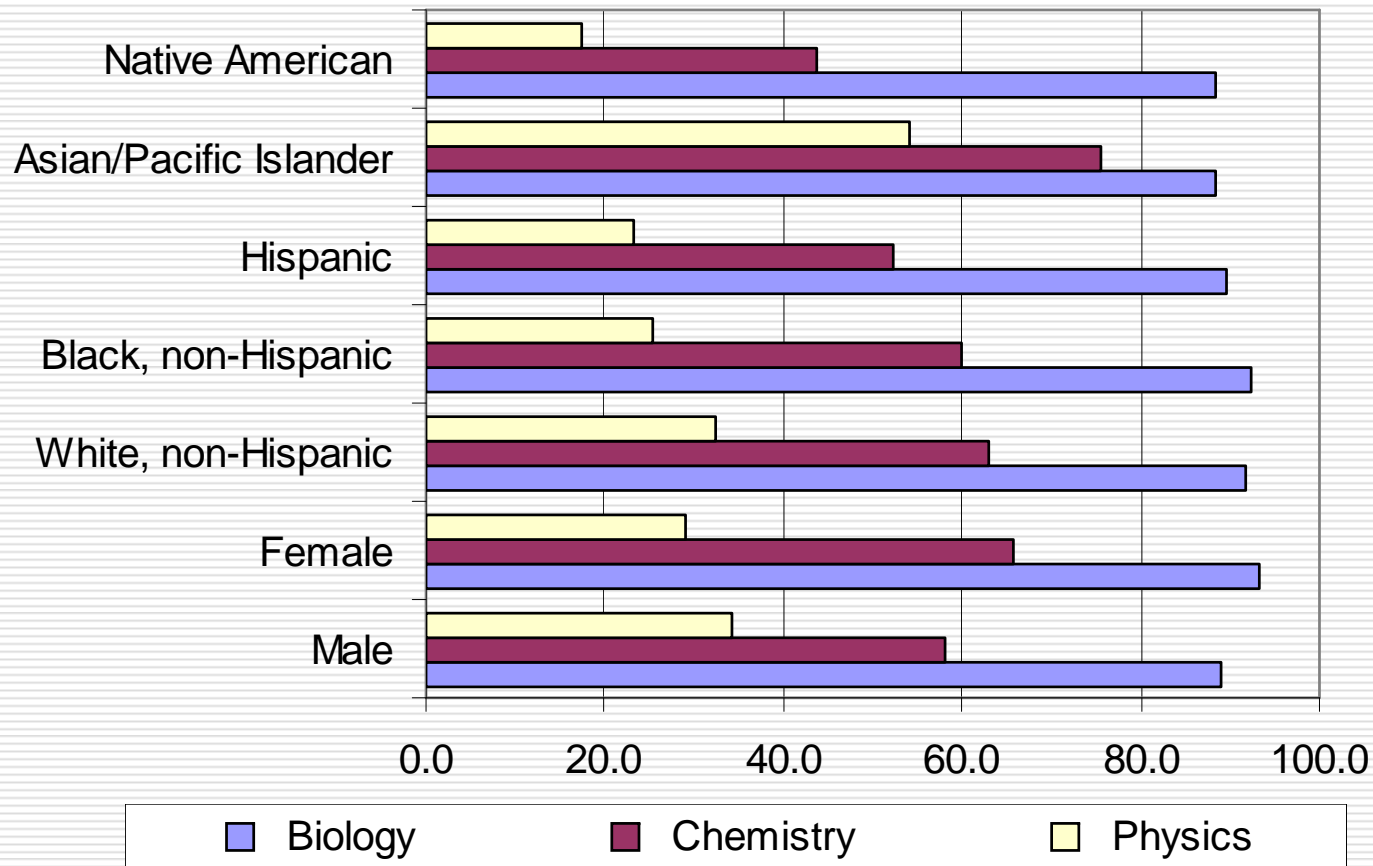
- **As a consequence of a lack of diversity we pay an opportunity cost, a cost in designs not thought of, in solutions not produced.**

Source: Dr. Bill Wulf, Past President, National Academy of Engineering

- **If we do not engage women and minorities in the engineering enterprise, we are ignoring more than 50% of America's intellectual talent.**

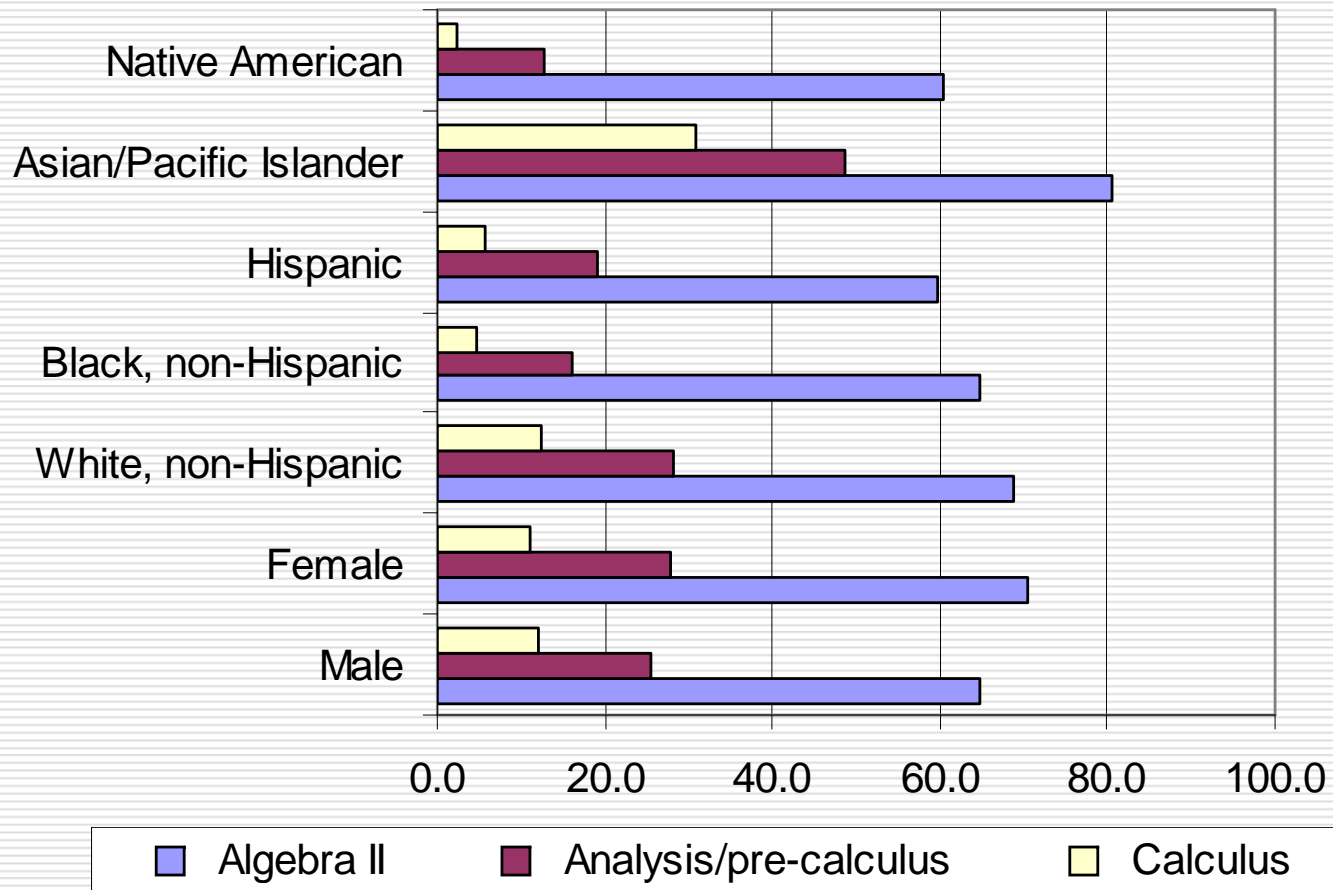
Source: Bostonworks.com

What Science Courses Are U.S. High School Students Taking? 2004



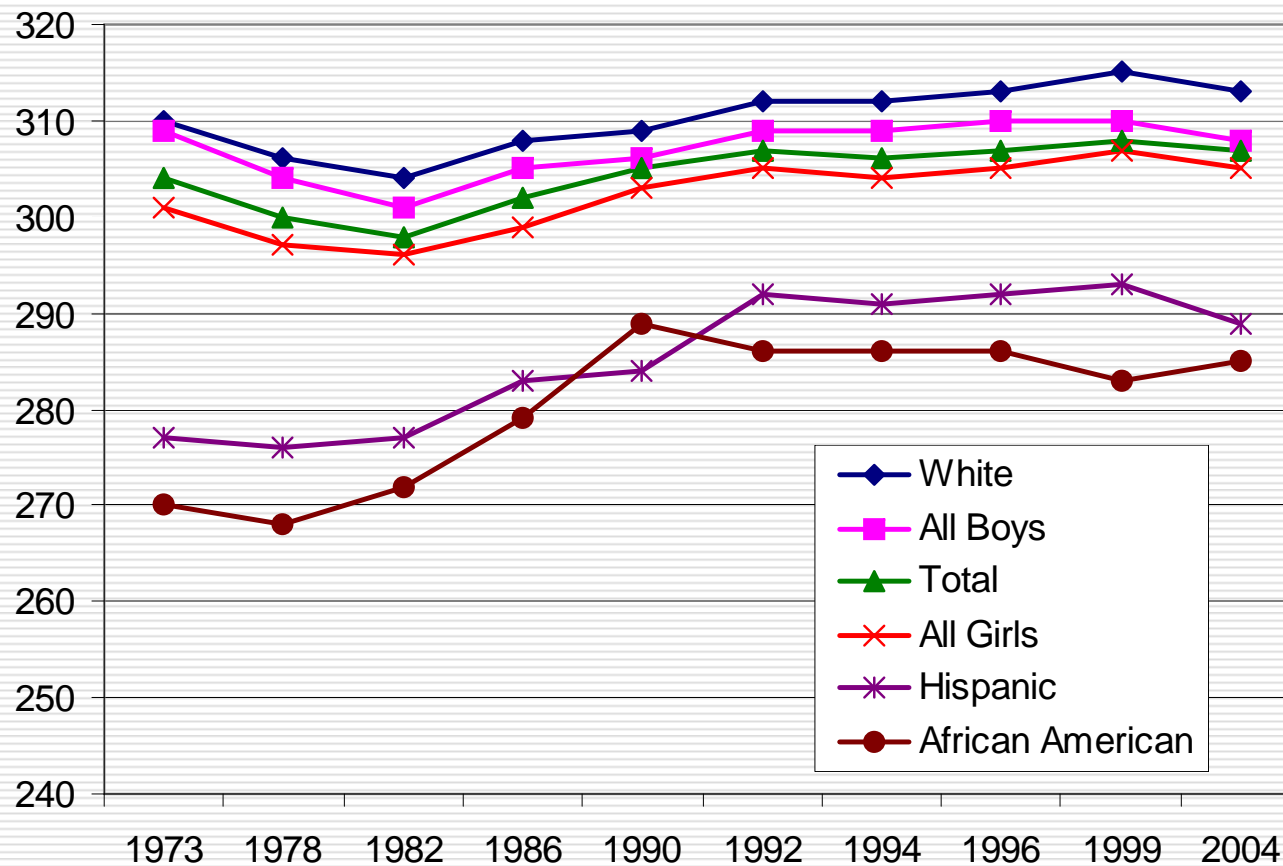
Source: CPST, data derived from National Center for Education Statistics

What Mathematics Courses Are U.S. High School Students Taking? 2004



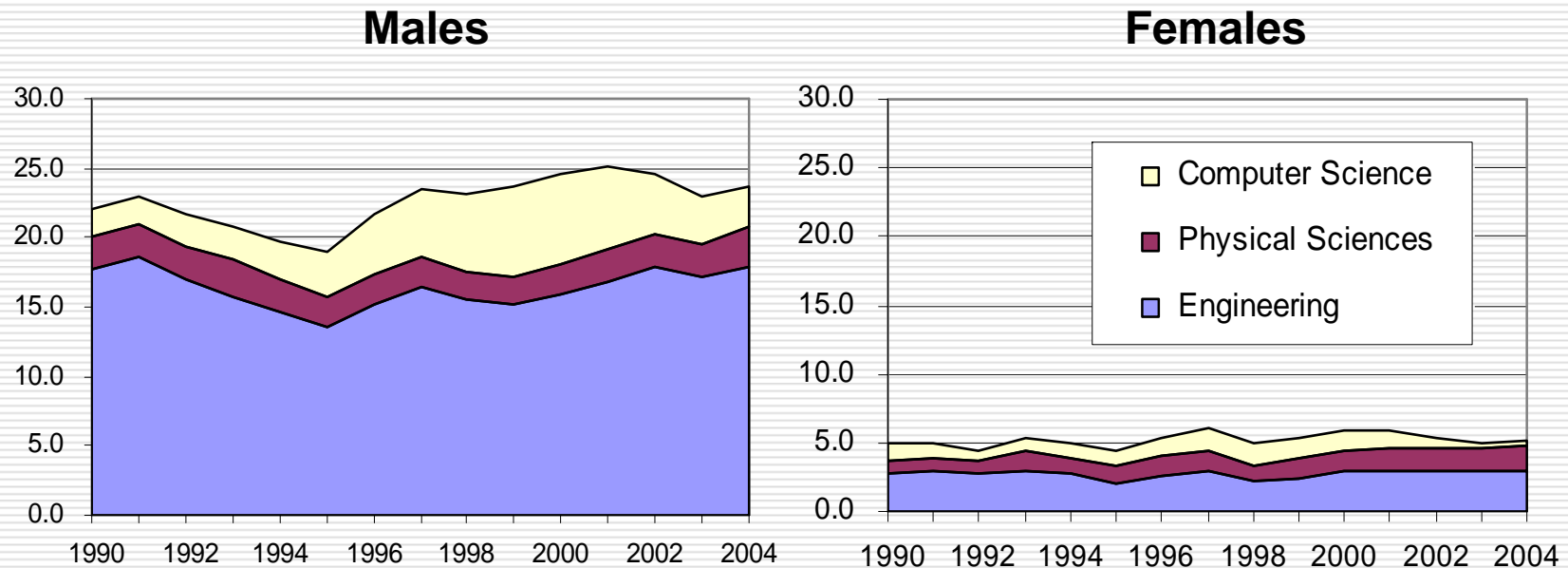
Source: CPST, data derived from National Center for Education Statistics

Trends in NAEP Math Scores by Sex and Race/Ethnicity, Age 17, 1973-2004



Source: CPST, data derived from National Center for Education Statistics

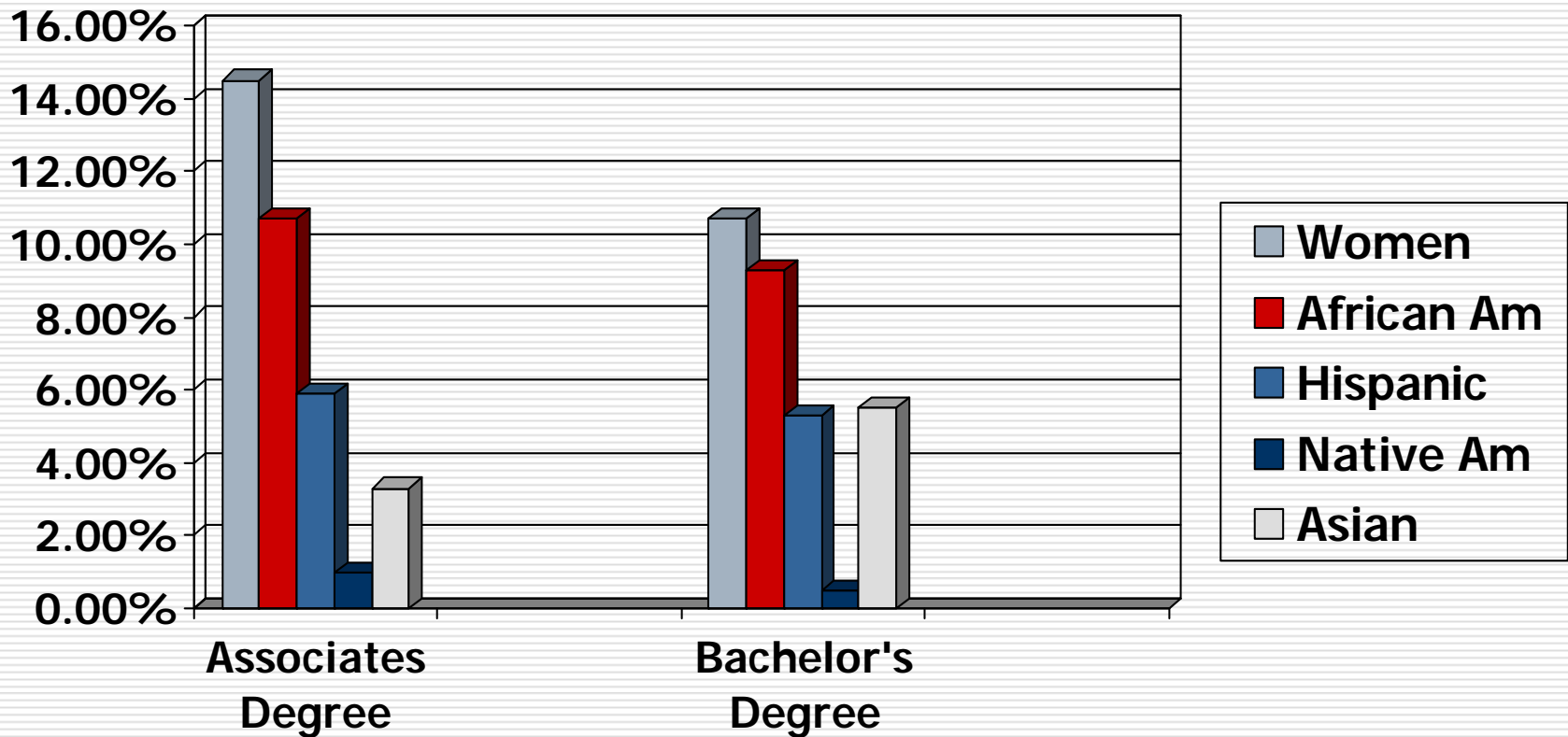
Males Far More Likely to Plan to Major in Technical Fields Than Are Females



Source: CPST, data derived from Higher Education Research Institute

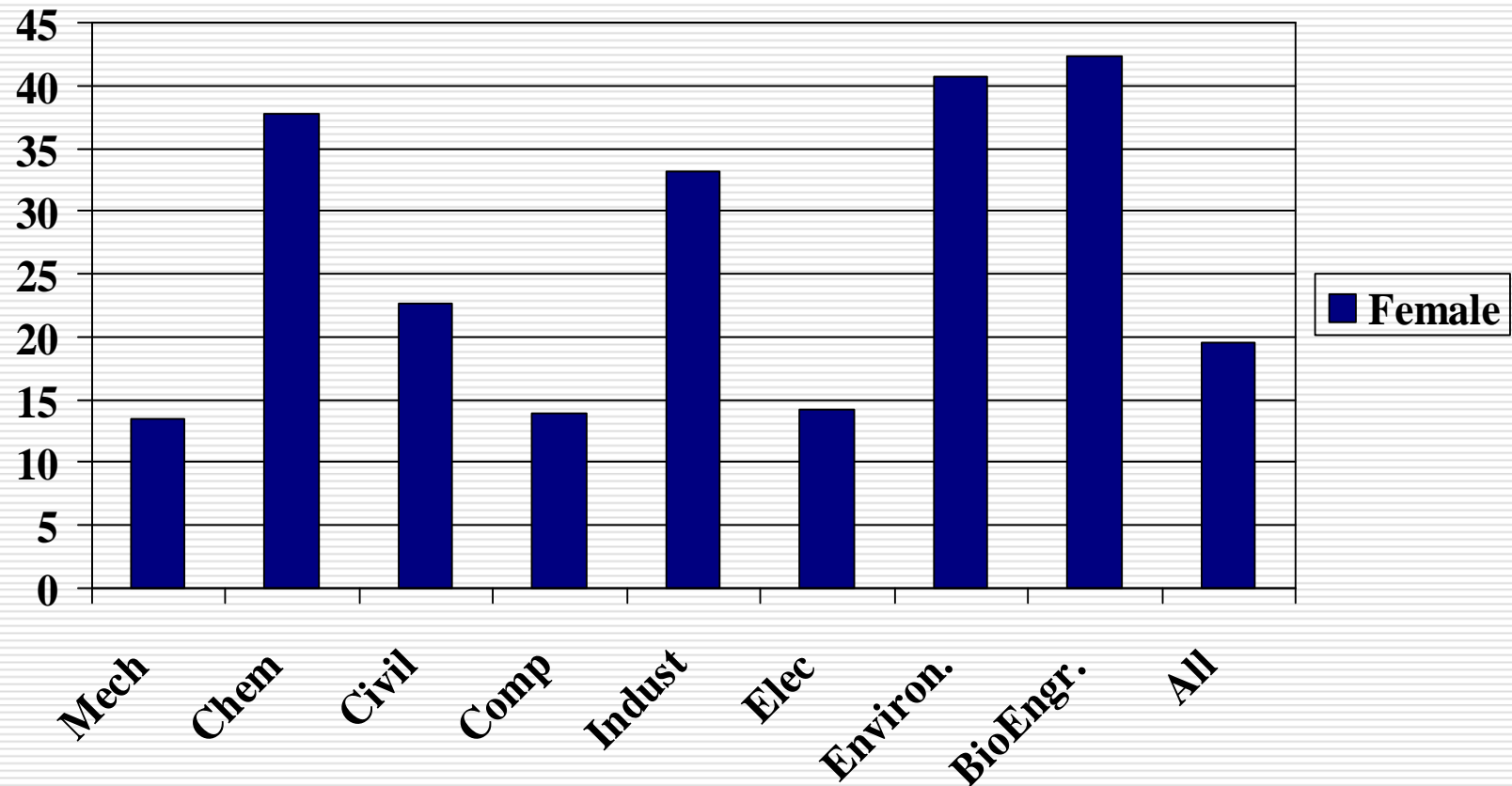
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Engineering Technology Degrees Granted 2005



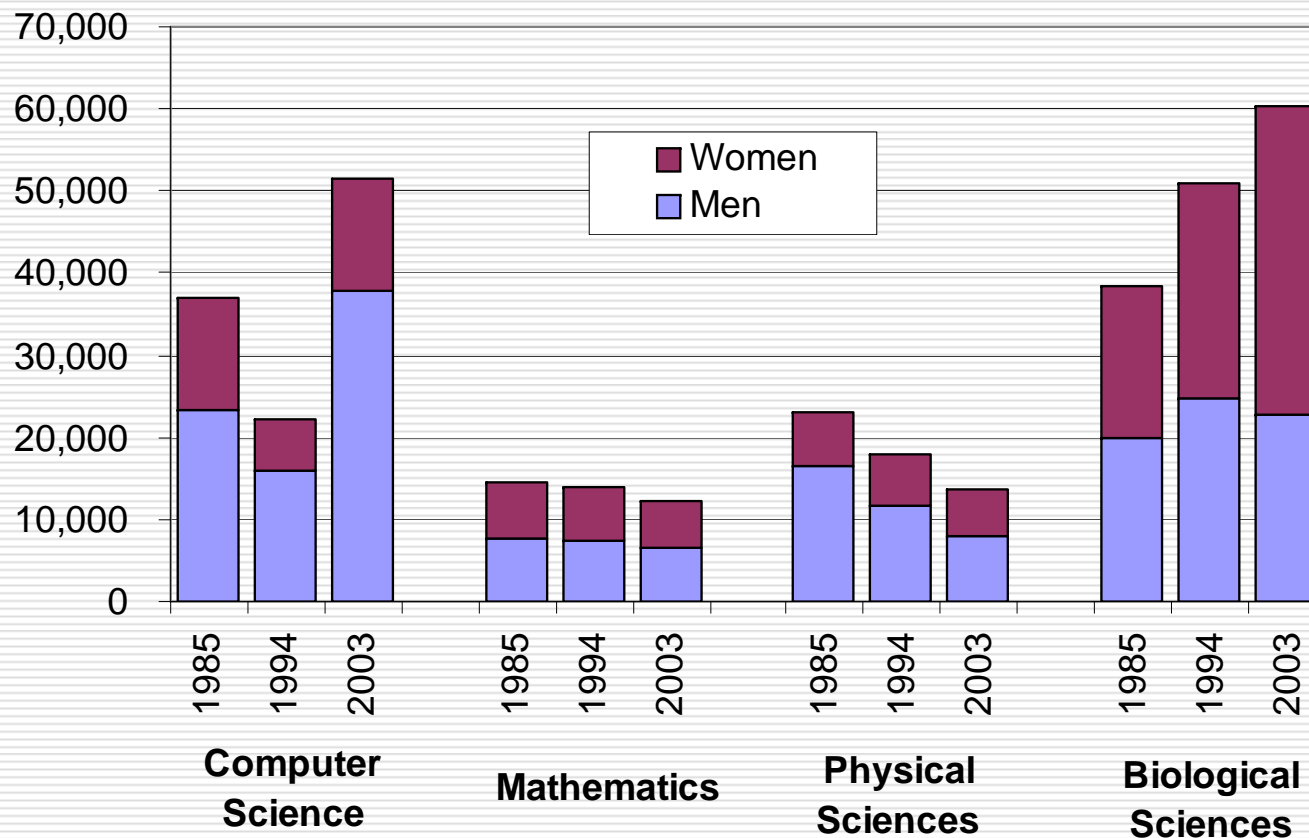
Source: CPST, data derived from Engineering Workforce Commission

Bachelor's Degrees Granted by Engineering Discipline 2005



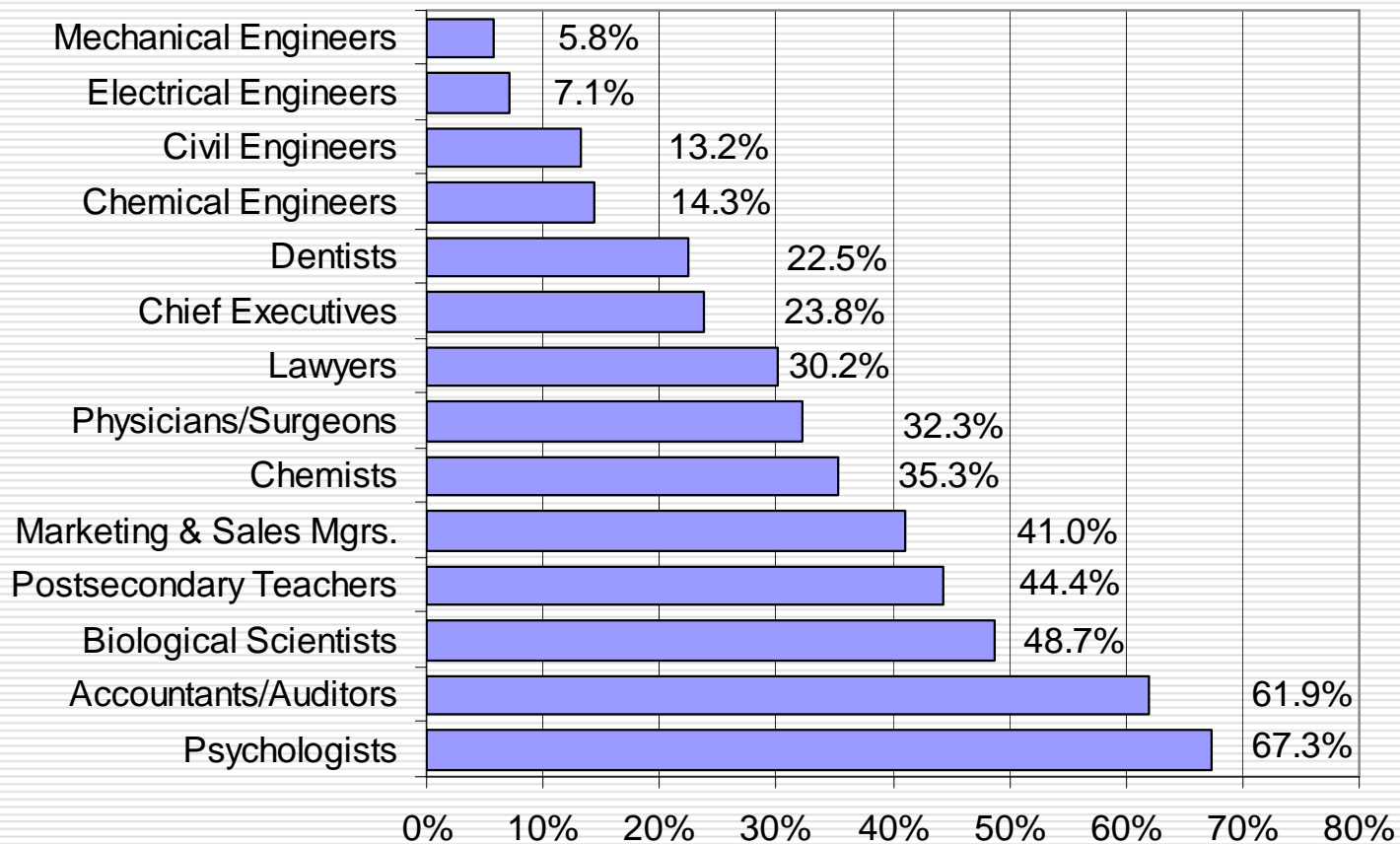
Source: CPST, data derived from Engineering Workforce Commission.

Women Increasing Their Share of Some STEM Bachelor's Degree Fields



Source: CPST, data derived from NSF and NCES

Women as a Percentage of Selected Occupations in 2005



Source: CPST, data derived from Bureau of Labor Statistics

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Median Annual Salaries of Full-Time Engineers and Scientists 2005

- **Engineers: \$63,500 (Range: \$60,500 – \$73,000)**
- **Engineering Technicians: \$41,000**
- **Mathematical & Computer Scientists: \$59,000**
- **Medical Scientists: \$48,500**
- **Biological & Life Sciences: \$46,500**
- **Science (Chemical) Technicians: \$36,500**

Barrier Busters

What can you do to support
Girl's exploration of
nontraditional careers

Early Exposure

- Most students pursuing a nontraditional career have had a friend or family member influence them
- Spark an interest that would otherwise not be evident
- The earlier the better



Nontraditional Role Models

- Strongest evidence in the research
- Need to see someone that looks like them in the career
- Family members are significant
- Teachers
- Mentors



Self-efficacy

- Attribution Theory
 - Girls more likely to attribute success to external factors and failure to internal factors
 - Stereotype Threat
 - Stereotype that girls are not as capable as boys in math affects their performance
 - Locus of Control
 - When girls feel they are in control of their lives and their futures they are more likely to select nontraditional options
-

Parental Support

- Parents are the #1 influence of student college major and career choice
 - Negative messages from people with emotional influence difficult to overcome.
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Parents as Advocates

- Talk to your daughter about ALL her career options
 - Encourage and support exploration
 - Listen to your daughter for subtle and not so subtle negative messages – stop them
 - Advocate for your daughters access and success
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School Climate

- Nontraditional faculty and staff
- Acceptable behavior in hallways, cafeteria, school events, busses, etc.
- Administration and staff support and encouragement
- Extracurricular activities



Career Guidance Materials and Practices

- More than just brochures and posters
 - Subtle messages
 - Be careful about how you use interest inventories
 - Creating opportunities to create student interest
-

Access to and Participation in STEM

- Shrinking gender gap in performance on national assessments in math and science between boys and girls
 - Still significant gaps when looking at gender AND race/ethnicity or socio-economic status
 - Girls not translating their academic success in STEM to careers in STEM
-

Classroom Climate



- Fair treatment
 - Sexual harassment not tolerated or ignored
 - Supportive learning environment
 - Subtle messages
 - Classroom location on campus
 - Physical environment
-

Curriculum Materials

- Invisibility
- Stereotyping
- Imbalance/Selectivity
- Unreality
- Fragmentation/Isolation
- Linguistic Bias
- Cosmetic Bias
- Relevance



Instructional Strategies

- Questioning level and wait time
 - Student/teacher interaction and feedback
 - Classroom management
 - Cooperative learning design
 - Expectations and assessment
-

Student Attitudes/Peer Influence

- Values and beliefs
- Acceptance of differences
- Bias and stereotypes
- Peer support
- Peer harassment



Student Isolation

- Cohort of underrepresented students in a program are more likely to complete than a single individual
 - Individuals more likely to
 - Have trouble integrating effectively in to social structure
 - Suffer decreased performance
 - Drop out
-

Support Services

- Tutoring
 - Child care
 - Transportation
 - Financial Aid
 - Books, Equipment, Tools, Clothing
 - Tuition
 - Modification of Curriculum, Equipment
 - Student/Teacher Aides
 - More
-

Questions?

