



NAPE

The STEM Equity Pipeline

NASSMC

Arlington, VA

April 26, 2012



N A P E E F

Status of Women and Girls in STEM



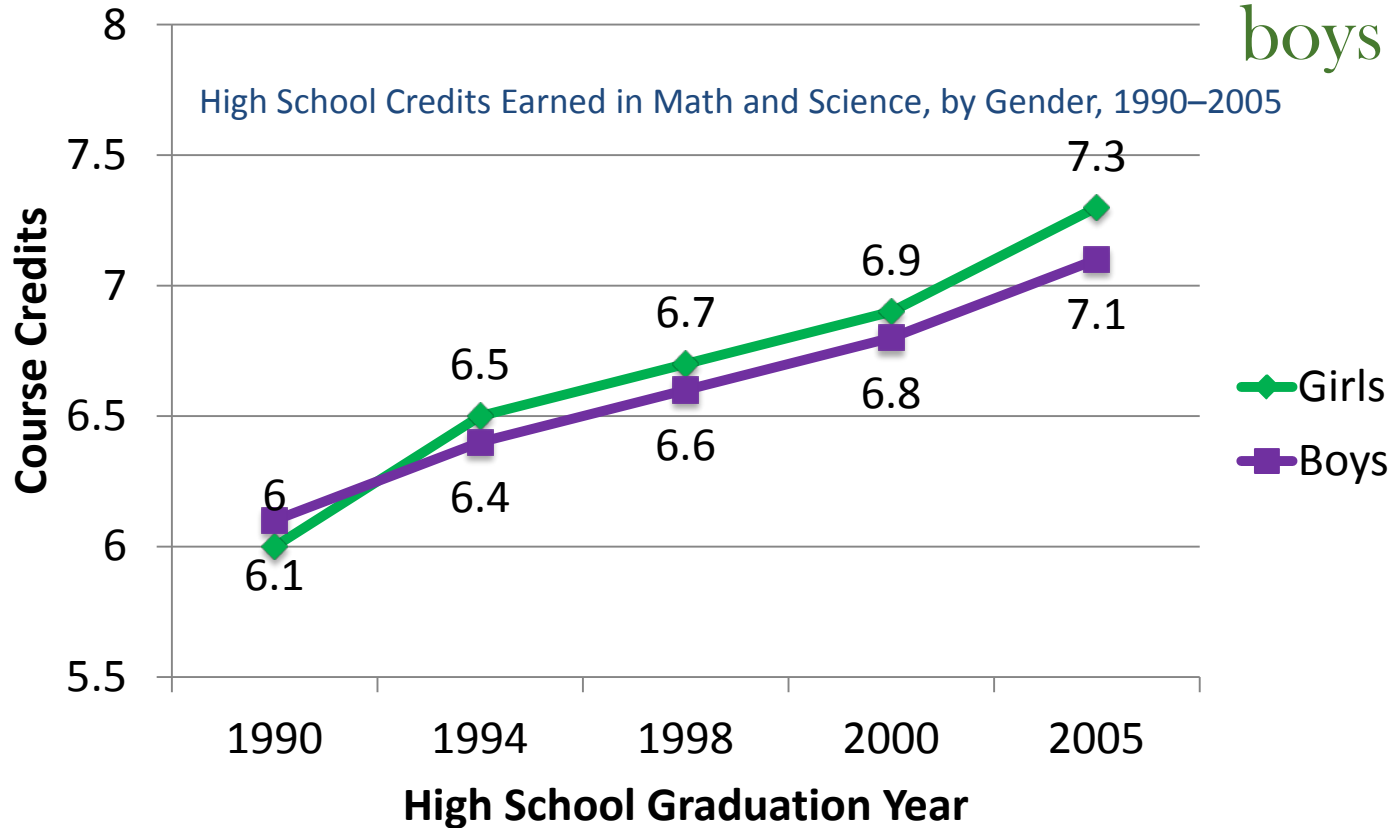
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Girls' performance and participation in math and science subjects in high school has improved over time and, in some cases, has surpassed that of boys.



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In high school, both boys and girls are earning more credits in math and science over time, and girls earn more credits than boys do.



Source: U.S. Department of Education, National Center for Education Statistics, 2007, *The Nation's Report Card: America's high school graduates. Results from the 2005 NAEP High School Transcript Study*, by C. Shettle et al. (NCES 2007-467) (Washington, DC: Government Printing Office).

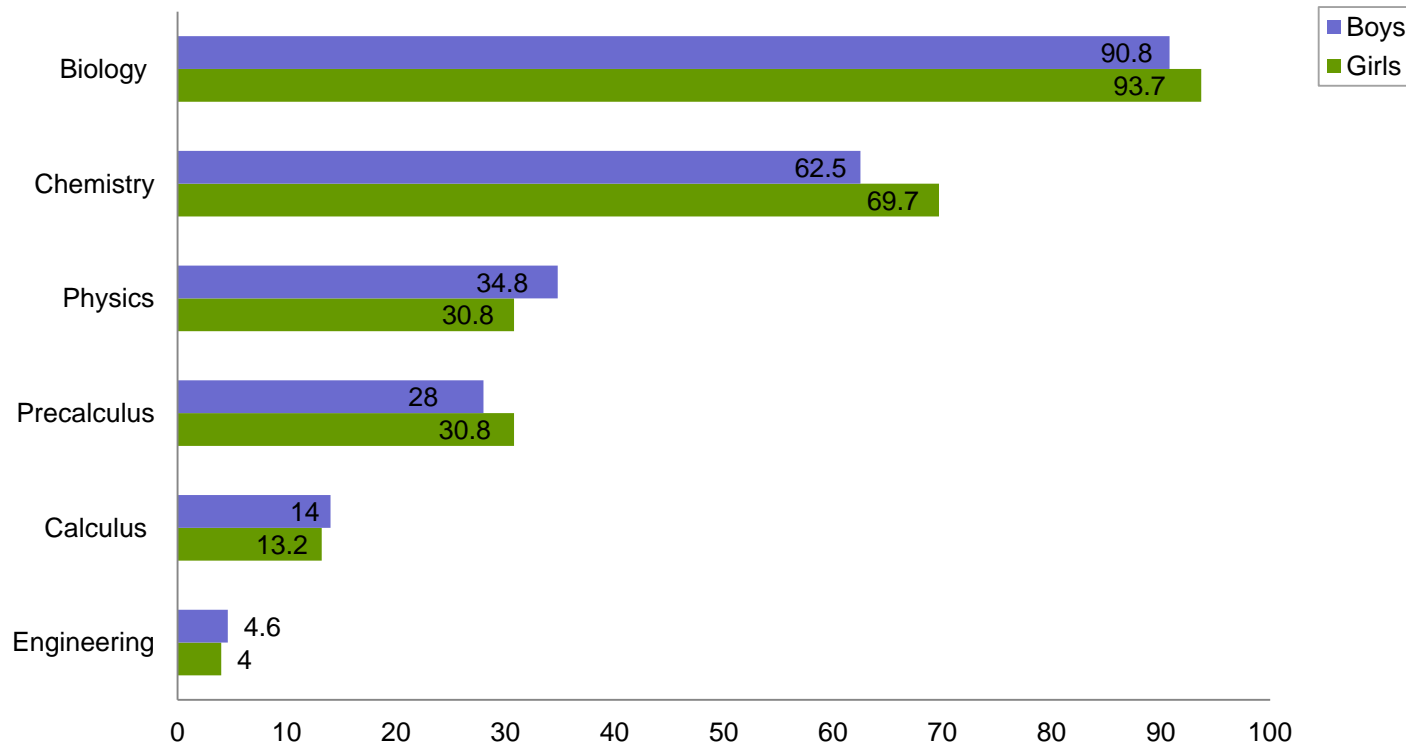
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High school girls are more likely to take biology, chemistry, and pre-calculus than boys are, but girls are less likely to take physics.

Percentage of High School Graduates Who Took Selected Math and Science Courses in High School, by Gender, 2005



Source: National Center for Education Statistics. (2007). *Digest of Education Statistics*.

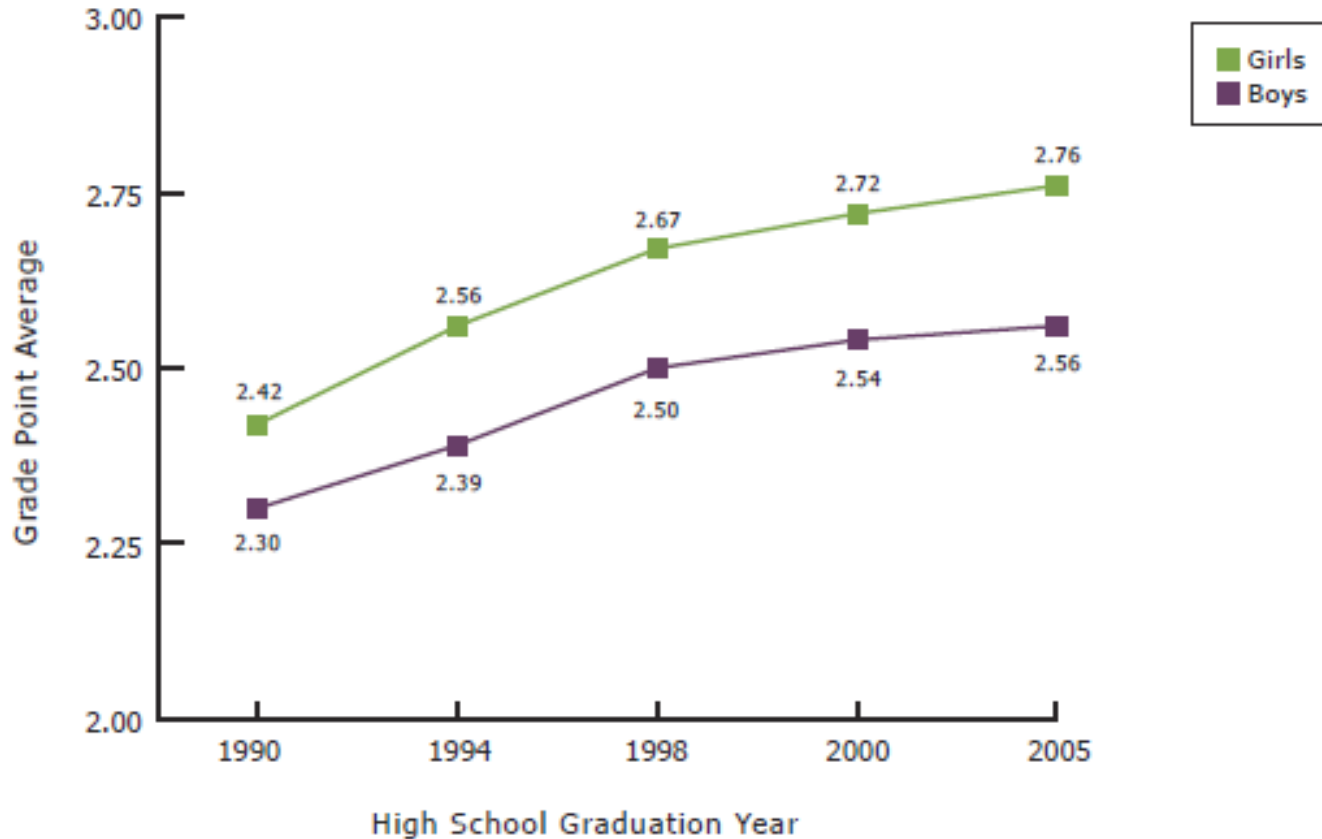
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Female high school graduates now also earn higher GPAs, on average, in math and science, than their male peers do.

Grade Point Average in High School Mathematics and Science (Combined), by Gender, 1990–2005



Source: U.S. Department of Education, National Center for Education Statistics, 2007, *The Nation's Report Card: America's high school graduates: Results from the 2005 NAEP High School Transcript Study*, by C. Shettle et al. (NCES 2007-467) (Washington, DC: Government Printing Office).

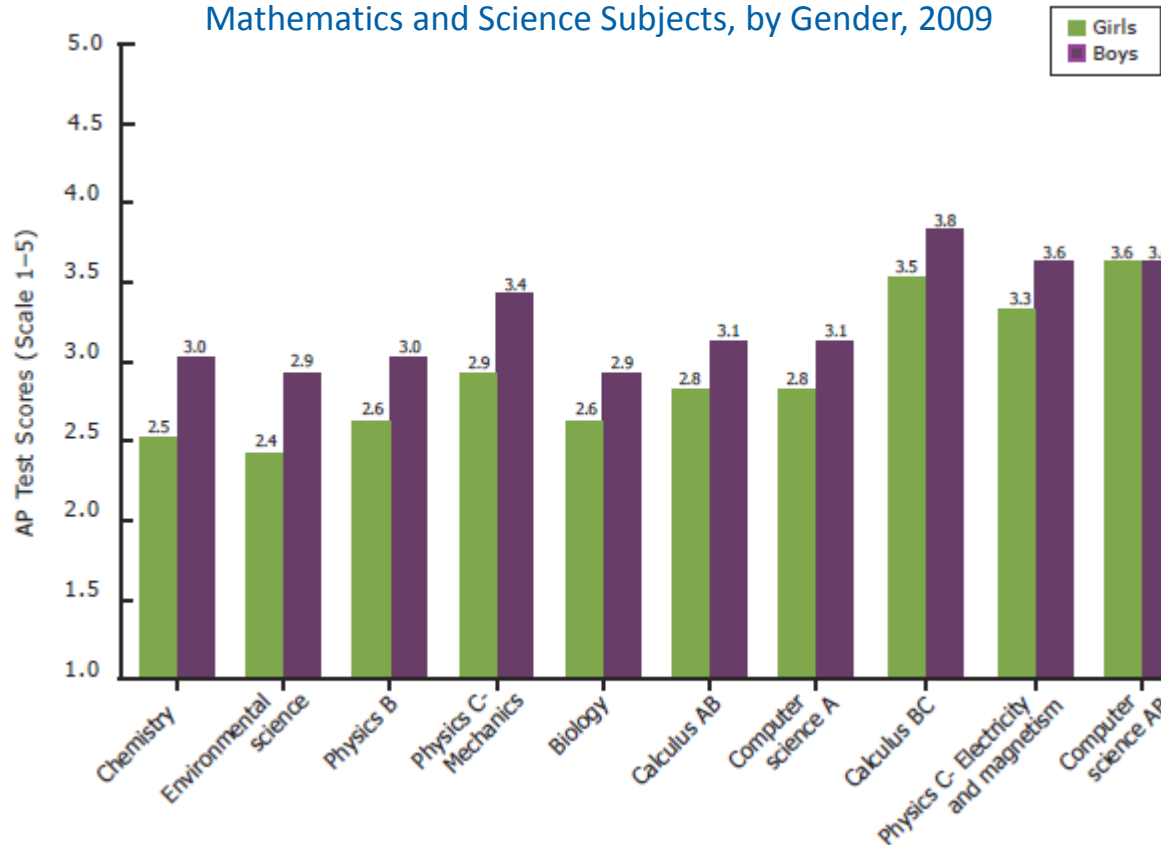
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On average, boys perform better than girls do on Advanced Placement (AP) tests in math and science.

Average Scores on Advanced Placement Tests in Mathematics and Science Subjects, by Gender, 2009



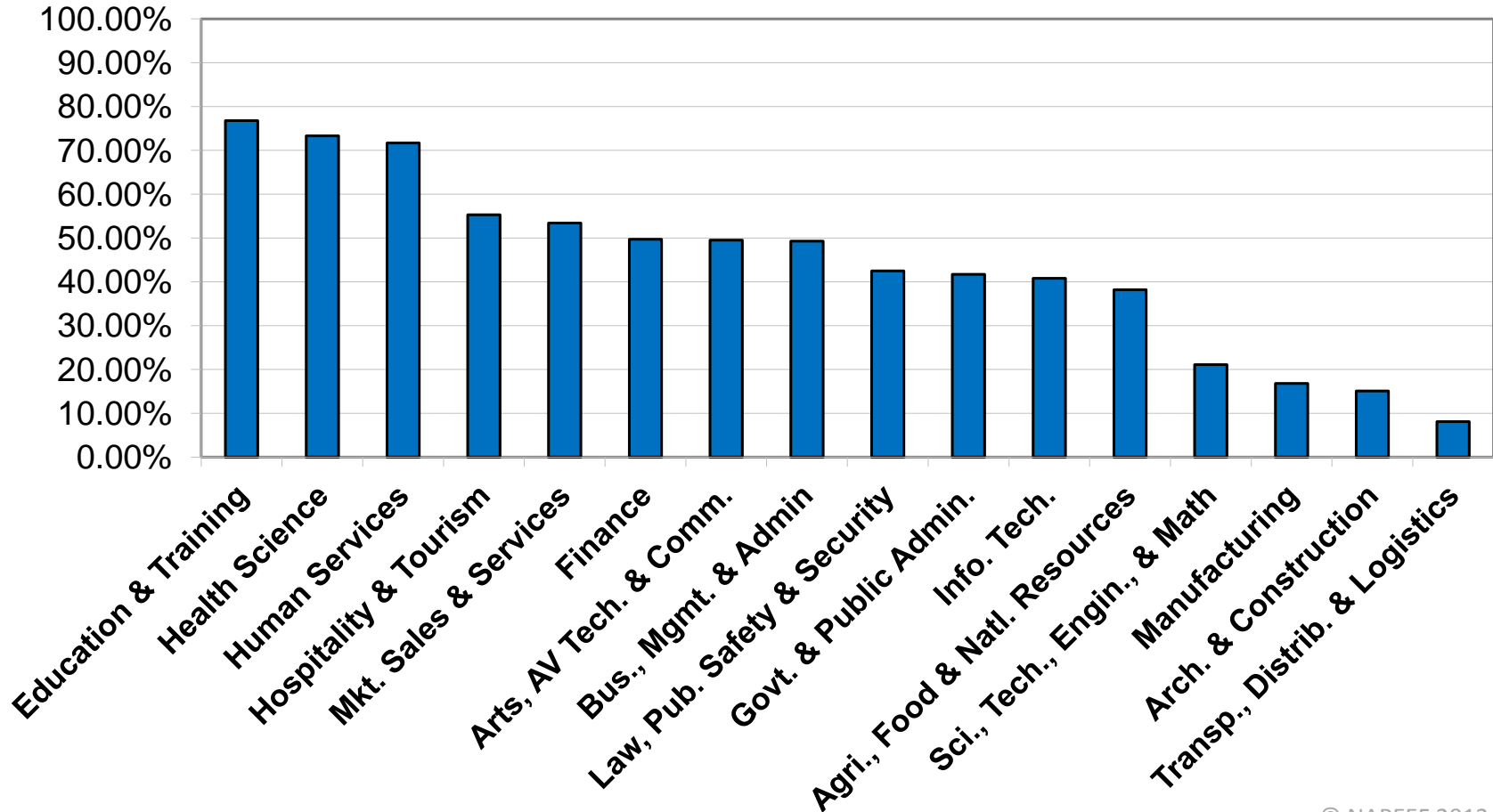
Source: Retrieved November 11, 2009, from the College Board website at www.collegeboard.com.

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CTE Secondary Female Enrollment in U.S. by Career Cluster, 2009-2010





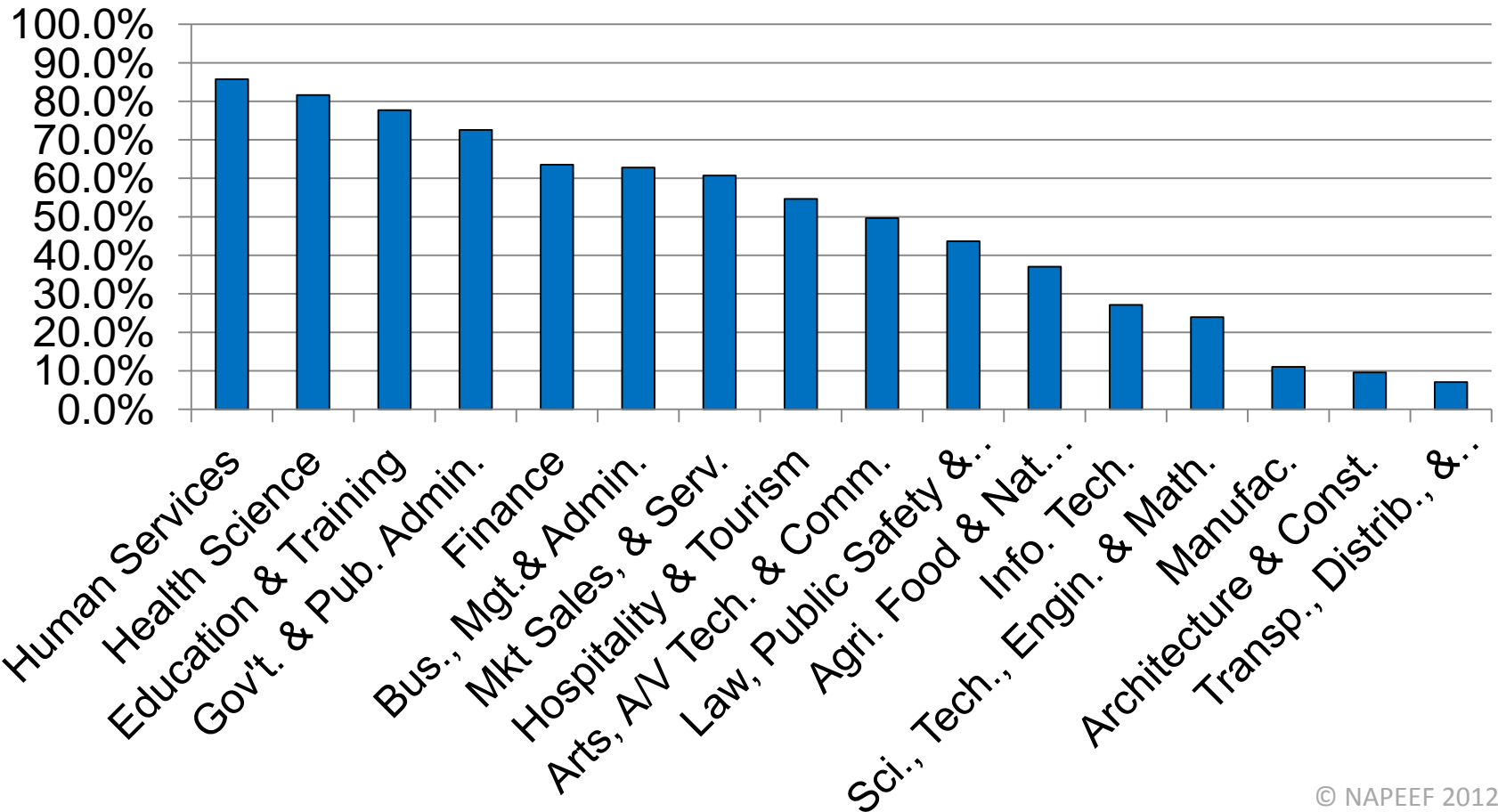
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Despite the positive trends in high school, the transition from high school to college is a critical time for young women in STEM (science, technology, engineering, and mathematics).



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CTE Post-Secondary Female Enrollment in U.S. by Career Cluster, 2009-2010

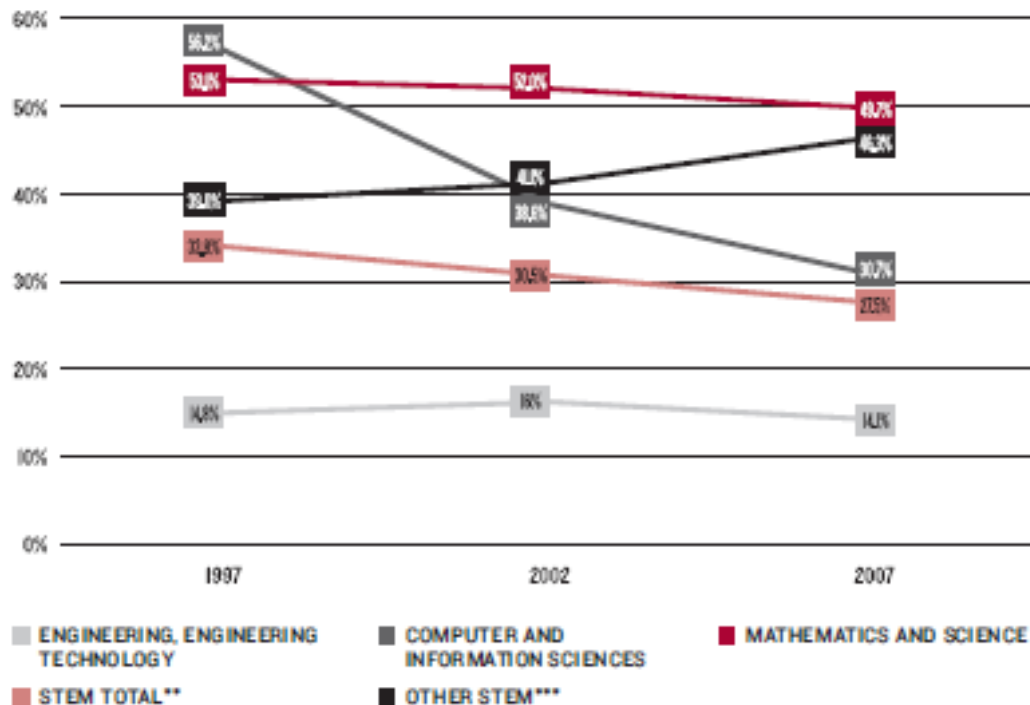




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In 2007, women earned 27.5% of all sub-baccalaureate awards in STEM, down from 33.8% in 1997

FIGURE 4
Women's Share of Subbaccalaureate Awards in Selected STEM Fields, 1997, 2002, 2007*





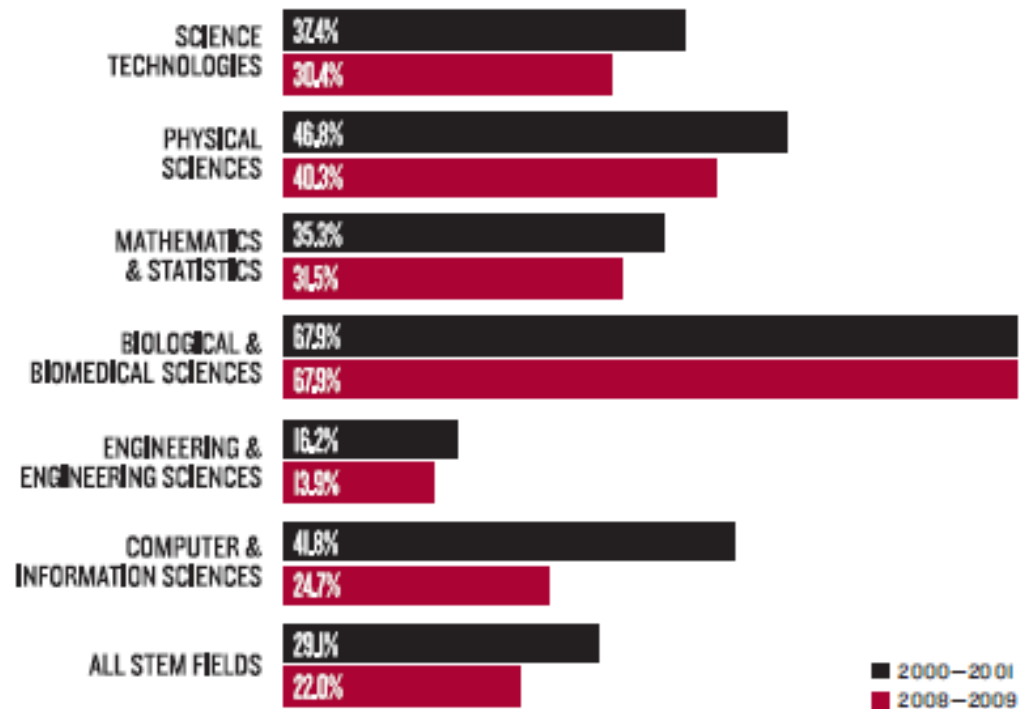
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Percentage of associates degrees awarded to women in STEM has declined in the past 8 years

- 3.3% to African American women
- 2.2% to Hispanic women
- 1.3% to Asian, Native Hawaiian, and Pacific Islander women

FIGURE 5

Percentage of Associate's Degrees Awarded to Women by STEM Field, 2000-2001 and 2008-09

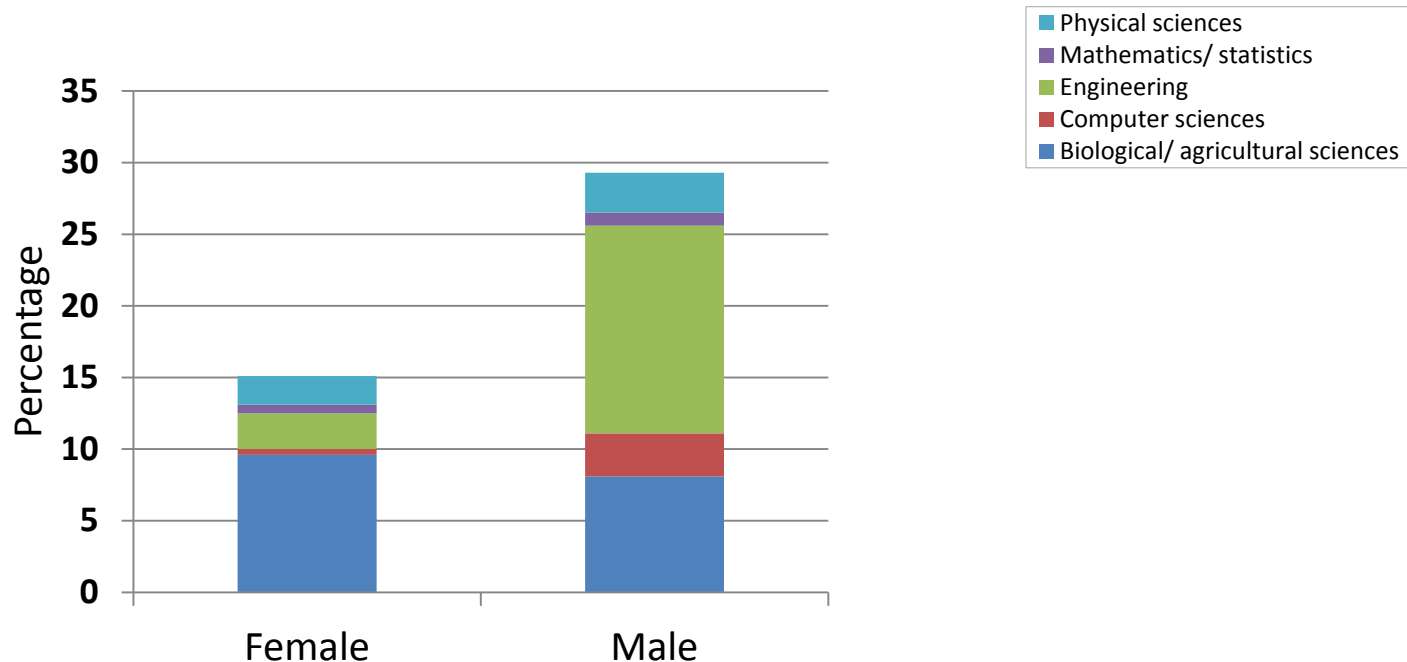


Source: U.S. Department of Education, National Center for Education Statistics, Postsecondary Awards in STEM by State, 2001 and 2009 (NCES 2011-226), Tables 9b and 9d.



Women are less likely than men are to declare a STEM major in college.

Intent of First-Year College Students to Major in Science and Engineering Fields, by Gender, 2006



Source: Commission on Professionals in Science and Technology. Data derived from Cooperative Institutional Research Program, Higher Education Research Institute, Graduate School of Education and Information Studies, University of California, Los Angeles, *The American Freshman: National Norms for Fall 1990 through Fall 2006*, www.gseis.ucla.edu/heri/heri.htm.

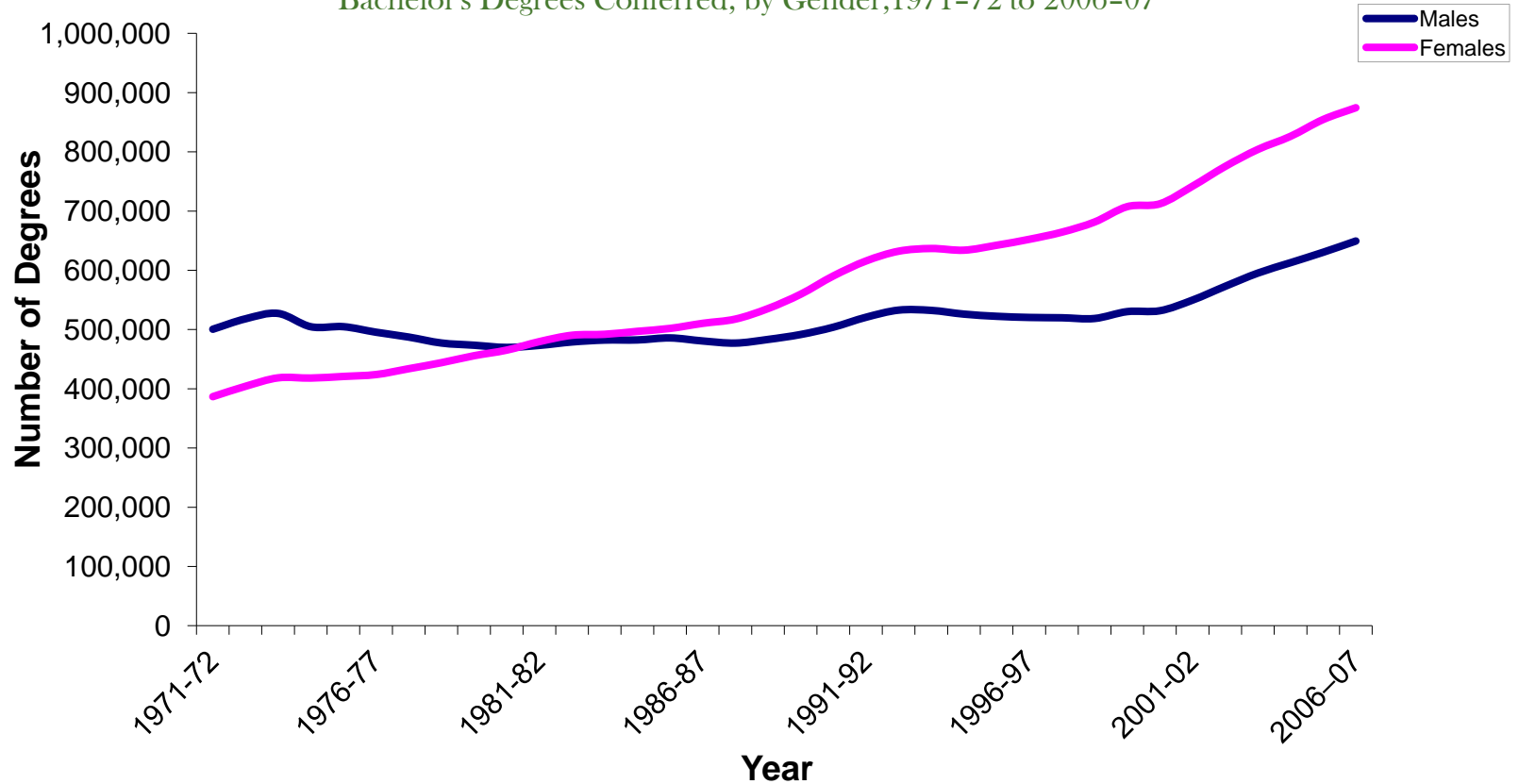
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Women have earned the majority of bachelor's degrees since 1982.

Bachelor's Degrees Conferred, by Gender, 1971-72 to 2006-07



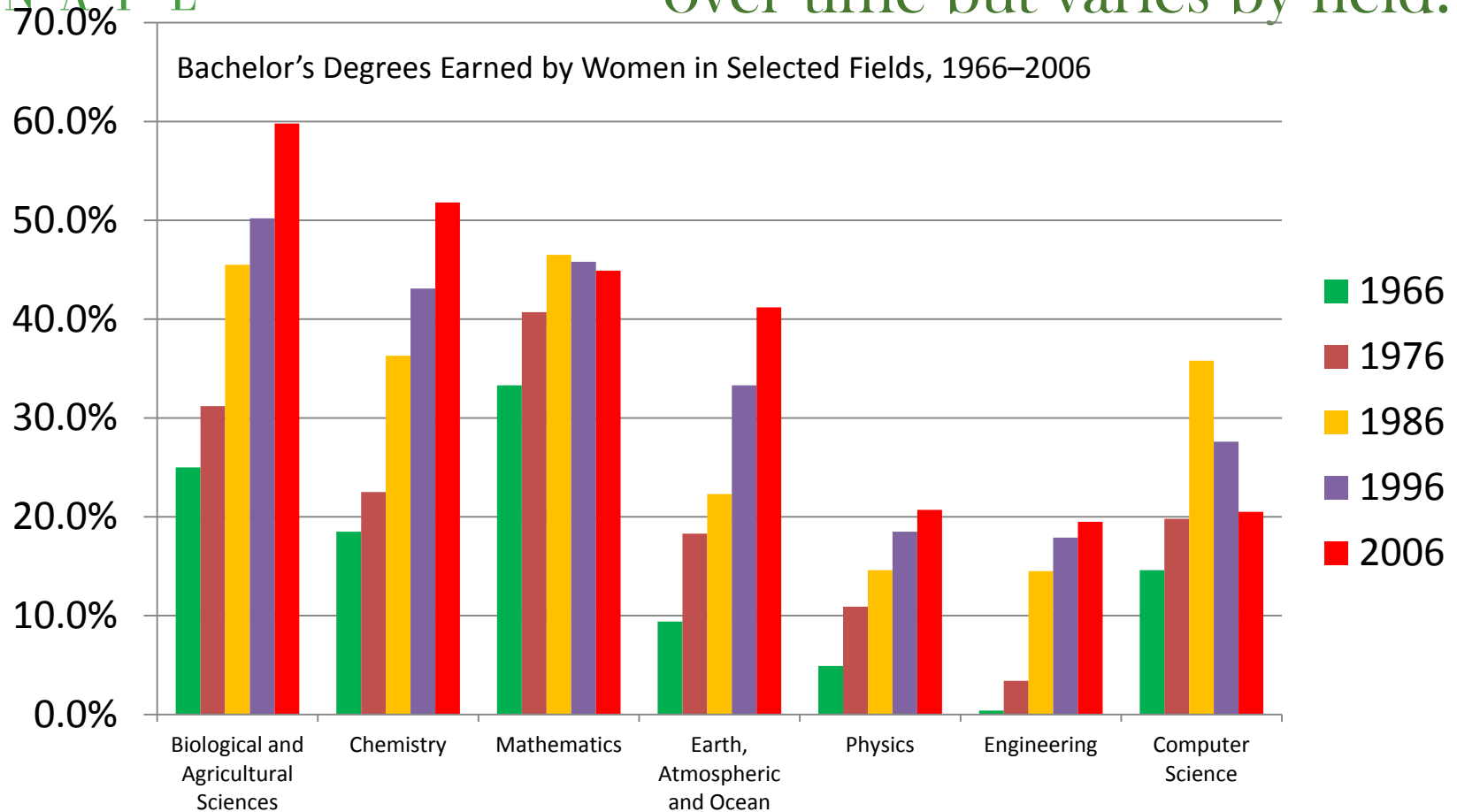
Source: Snyder, T.D., Dillow, S.A., and Hoffman, C.M. (2009). *Digest of Education Statistics 2008 (NCES 2009-020)*. National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

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Women's representation among STEM bachelor's degree holders has improved over time but varies by field.

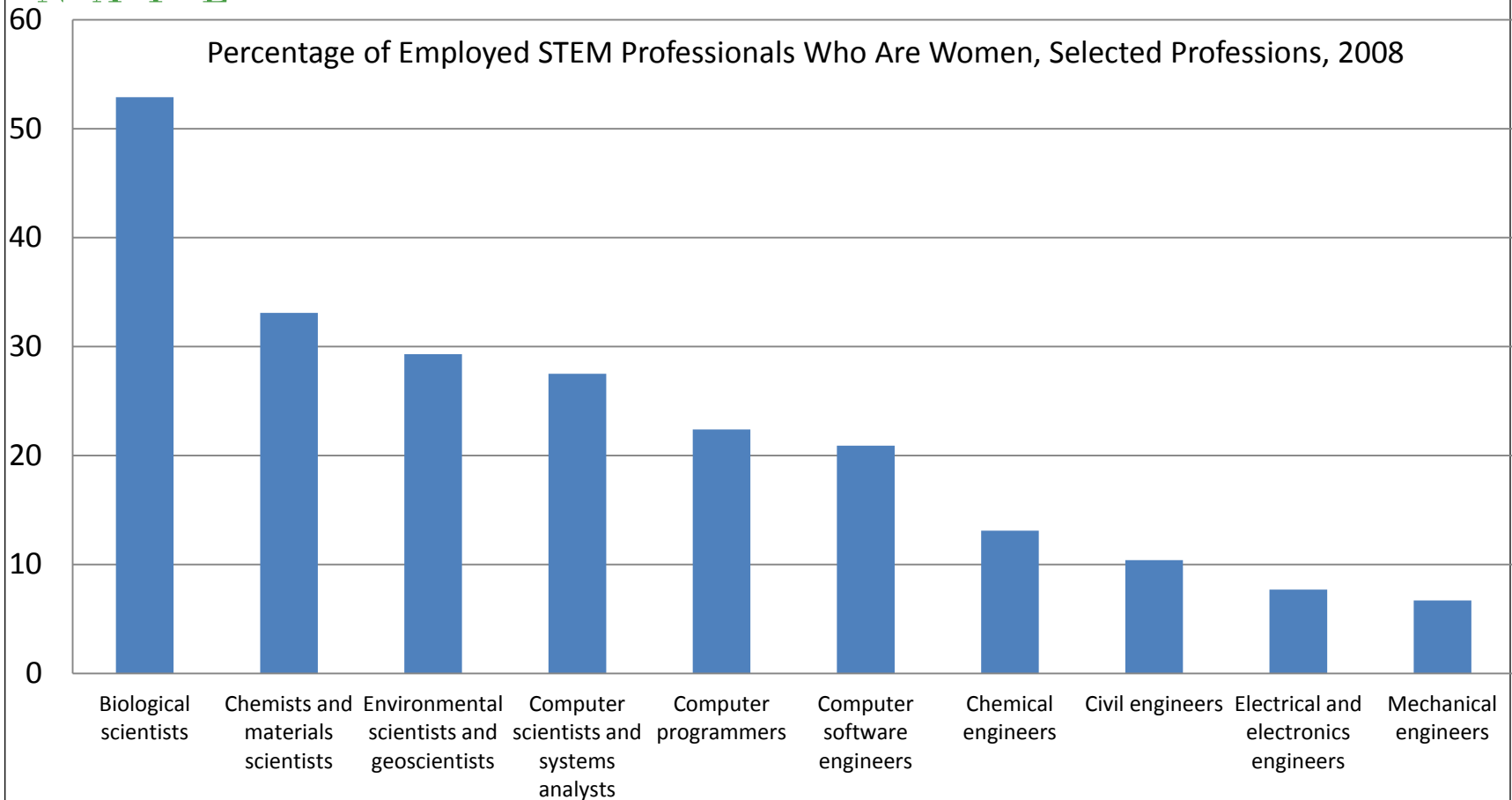


Source: National Science Foundation, Division of Science Resources Statistics 2008, *Science and engineering degrees: 1966–2006* (Detailed Statistical Tables) (NSF 08-321) (Arlington, VA), Table 11, Author's analysis of Tables 34, 35, 38, & 39.

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Women are underrepresented in many science and engineering occupations.



Source: U.S. Department of Labor, Bureau of Labor Statistics, 2009, *Women in the labor force: A databook* (Report 1018) (Washington, DC), Table 11.



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Why Do We Need to Encourage Students to Study STEM?

- 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⁾
- Aging STEM workforce- DOD, NASA and NIH STEM workers eligible to retire will more than double by 2012. ⁽¹⁾

Source: See Notes Page



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Why Do We Need to Encourage Students to Study STEM?

- The National Bureau of Labor Statistics projects that our greatest needs will be in computer-related field that propel innovation across the economy.
- By the year 2050, 85% of the entrants into the workforce will be people of color and women.
- Promoting scientific literacy among all the nation's people integral to an educated citizenry



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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



N A P E

What is NAPE doing to move the
needle?





STEM Equity Pipeline Goals

Goal

- To increase the academic performance, retention, completion and transition of significantly more diverse female students in STEM programs of study



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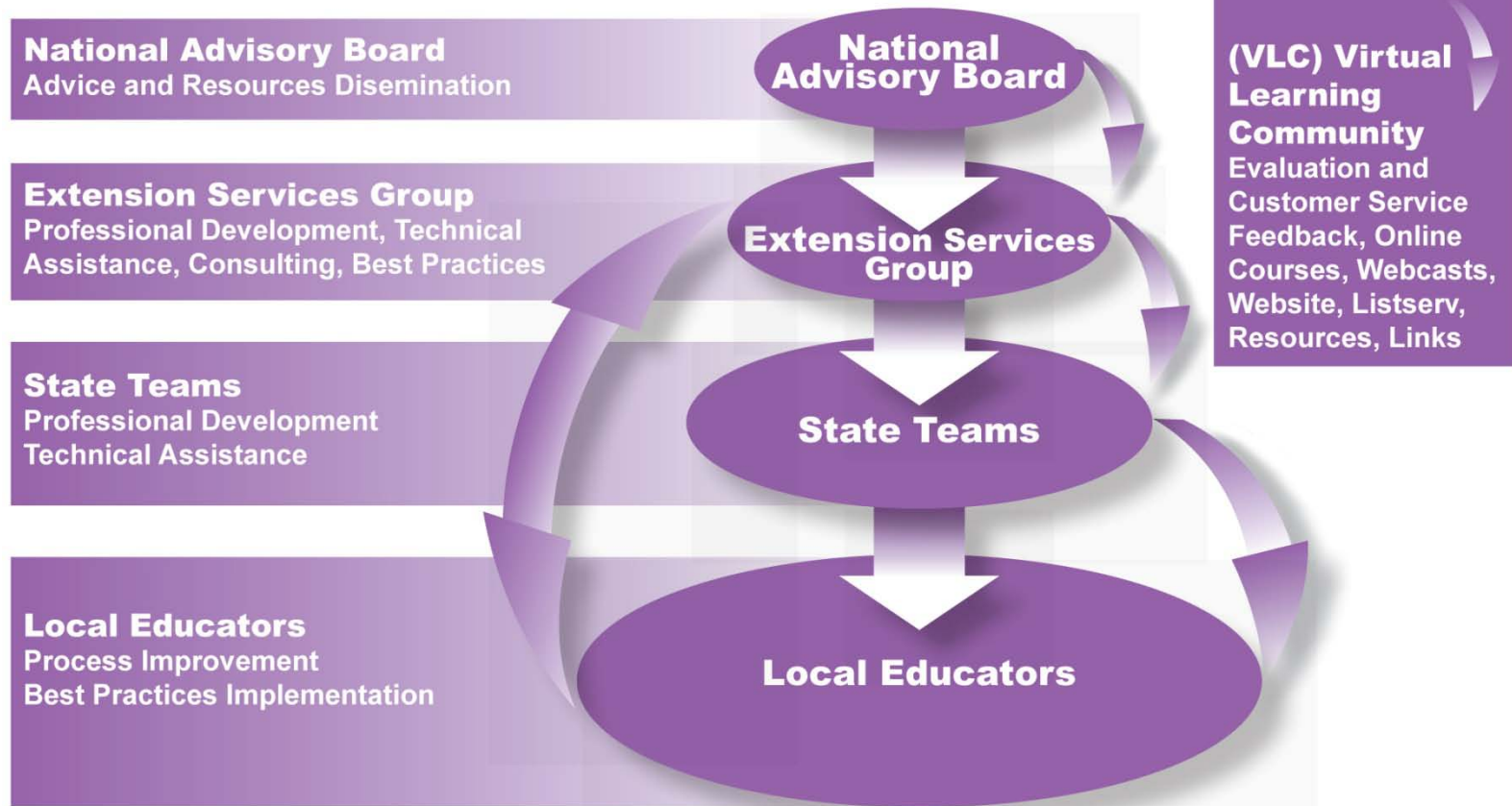
STEM Equity Pipeline Goals

- Build the capacity of the formal education community to provide high quality professional development on gender equity in STEM education
 - Institutional transformation
 - Classroom transformation
- Institutionalize the implemented strategies by connecting the outcomes to existing accountability systems
- Broaden the commitment to gender equity in STEM education



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STEM Equity Pipeline Model





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Professional Development for Educators: STEM (including CTE) Access, Equity, Diversity

STEM Equity Pipeline™

STEM Equity Training for Inst. Change

Working with institutional leaders (administrators, dept heads, etc.) to improve enrollment, retention & completion of girls & under-represented populations in STEM courses

STEM Equity Teacher Training

Training teachers to use pedagogy that improves enrollment, retention & completion of girls & under-represented populations in STEM courses

STEM Equity Counselor Training

Coaching counselors to encourage girls and under-represented populations in STEM careers

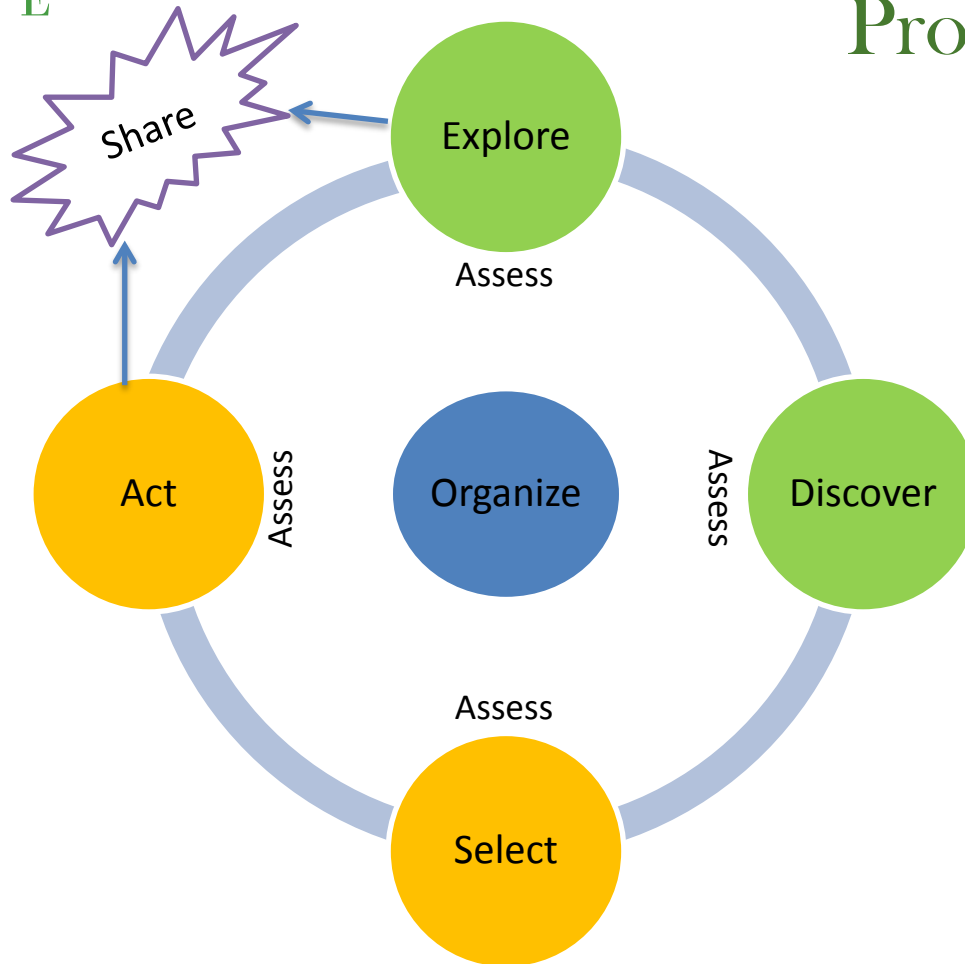
Tools & Resources

Tools to support teachers' & counselors' learning and assist their students, e.g., camps, partner orgs, books



PIPESTEM™

Program Improvement Process for Equity



- Phase One – Orientation
- Phase Two – Data and Root Cause Analysis
- Phase Three – Implementation and Evaluation



N A P E E

Participating States

- California
- Georgia
- Idaho
- Iowa
- Illinois
- Minnesota
- Missouri
- New Hampshire
- Ohio
- Oklahoma
- Pennsylvania
- Texas
- Wisconsin



Micromessaging to Reach and Teach Every Student™

Transforming Pedagogy

- Phase I : Data Collection and Analysis
- Phase II: E-Learning Content Knowledge
- Phase III Workshop
- Phase IV: Capstone - Action Research Project
- Phase V: Implementation Plan



Micromessaging to Reach and Teach Every Student™

Instructional Units

- Setting the Stage – Women in STEM
- The Influence of Micromessages
- Neuroscience Link to Learning
- Social Theories of Achievement
- Influence of Culture
- Career Development
- The Equitable Classroom



Micromessaging to Reach and Teach Every Student™

Pilot Testing

- *Maryland – phased in over three years across the state to both secondary and post-secondary.*
- *Texas – Dallas, Plano, and Richardson (2012) and expanding to Fort Worth Independent School Districts this fall.*



STEM Careers Counselor Training

- Goal: to support career counselors efforts to highlight STEM careers in a context that appeals to a diversity of students, their cultures, and their values.
- Currently a high quality workshop focusing on engineering.
- 2012 – 2013 building an intensive equity professional development program for secondary and college career counselors.



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STEM Equity Pipeline

REACH AND IMPACT



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STEM Equity Pipeline - 4 years

Reach

- 3000 attended workshops
- 50 pilot sites
- 547 PIPESTEM training
- 937 attended webinars
- 200,000 more educators reached by participants

Impact

- 1 to 11 in Aviation
- 8 to 34 in PLTW
- 4 to 15 in Auto Tech
- 0 to 5 in Welding Tech
- 0 to 6 in Auto Collision
- 15% to 55% seniors taking advanced math
- 4 - 6 fold increase in AP test taking and passage rates



NAPEE

Funders/Sponsors

- National Science Foundation
- Texas Instruments Foundation
- Texas Instruments
- Lockheed Martin
- Xerox
- Bell Helicopter
- Fluor Corporation
- U.S. Department of Education
- Communities Foundation of Texas
- Dallas Women's Foundation
- Posey Foundation
- High Tech High Heels Fund
- Motorola Solutions Foundation



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Questions

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