

Gender in Science and Math Education

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Women and STEM

- Why should science and math educators be concerned about girls and women in their classes?
- What is the current status of women in STEM?
- What can we do to help promote the participation of girls and women in STEM?

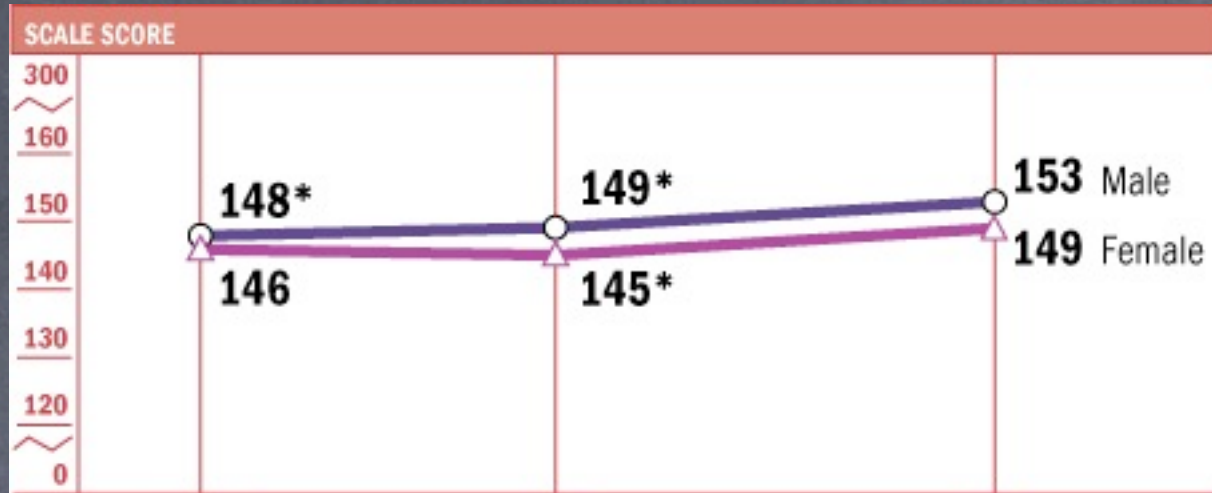
Why Worry?

- Need scientifically literate public
- Need technological/scientific workers
- Need to be working to maximize participation in STEM
- Are women participating equally with men in STEM fields?

NAEP

- NAEP (National Assessment of Educational Progress) test scores in science show a gender gap
- The data show the gender gap decreases over time, but increases with age

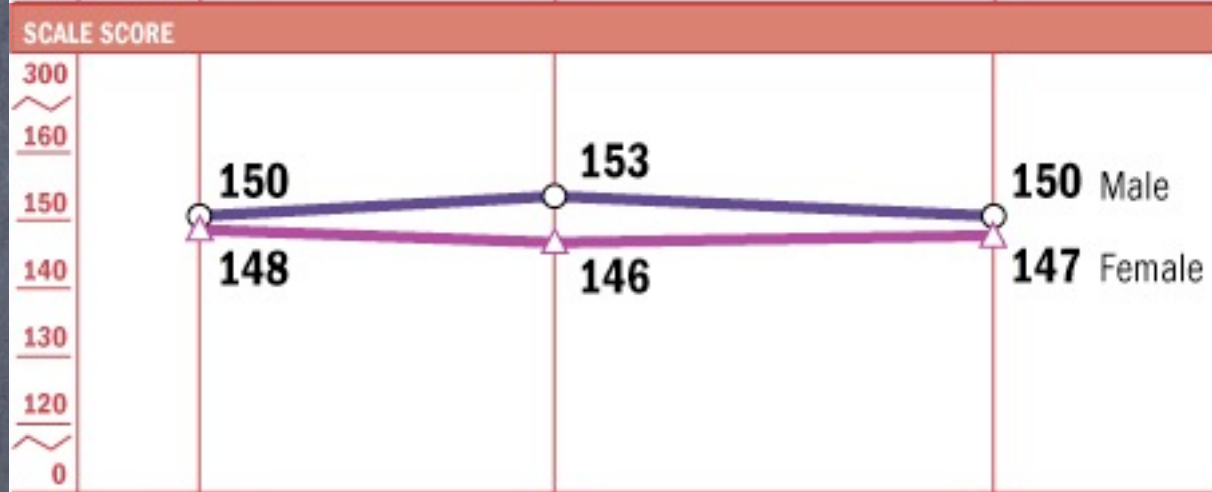
4th grade



2005 gap

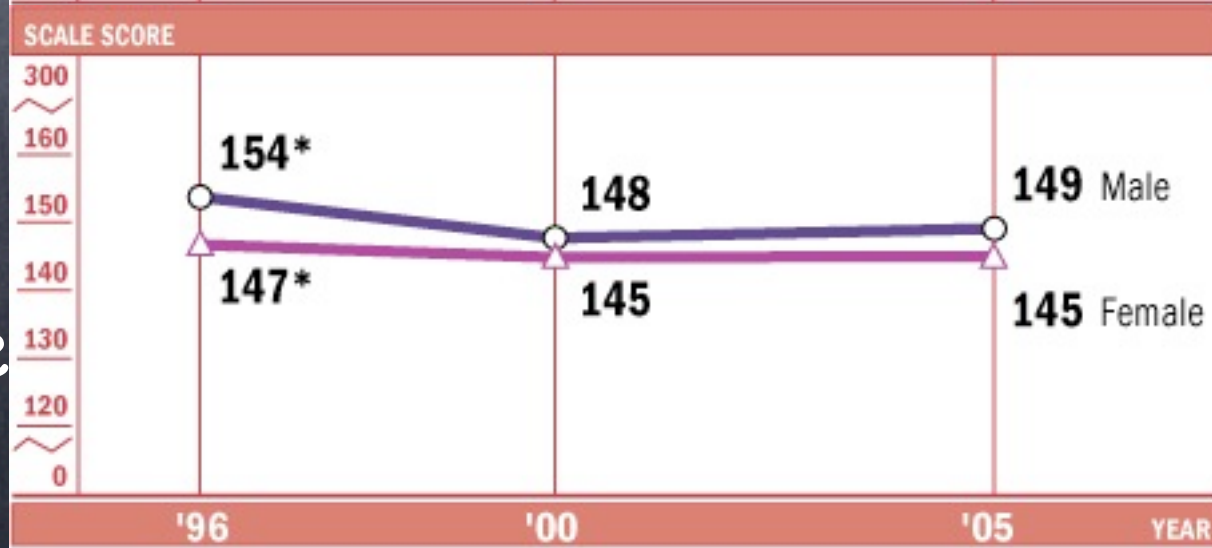
4 pts

8th grade



3 pts

12th grade

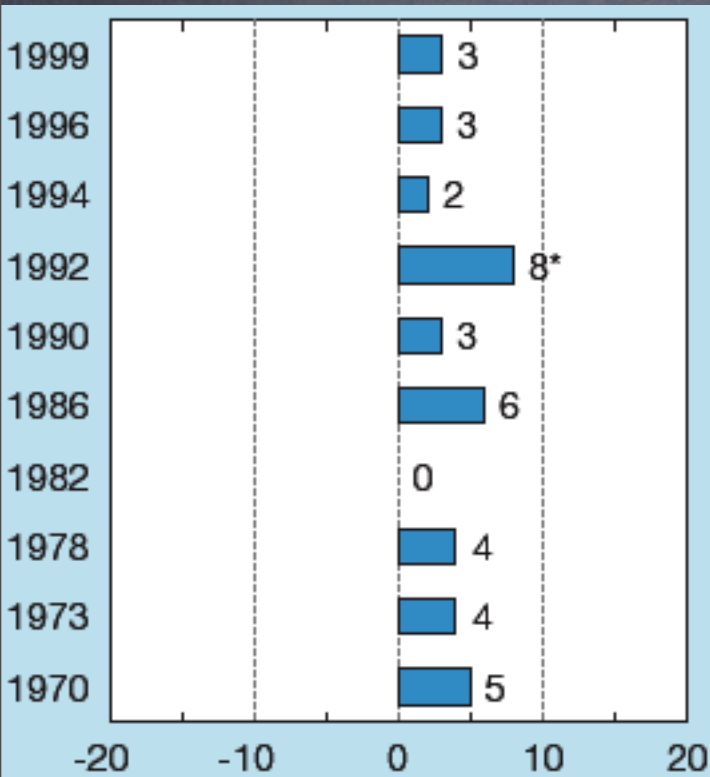


4 pts

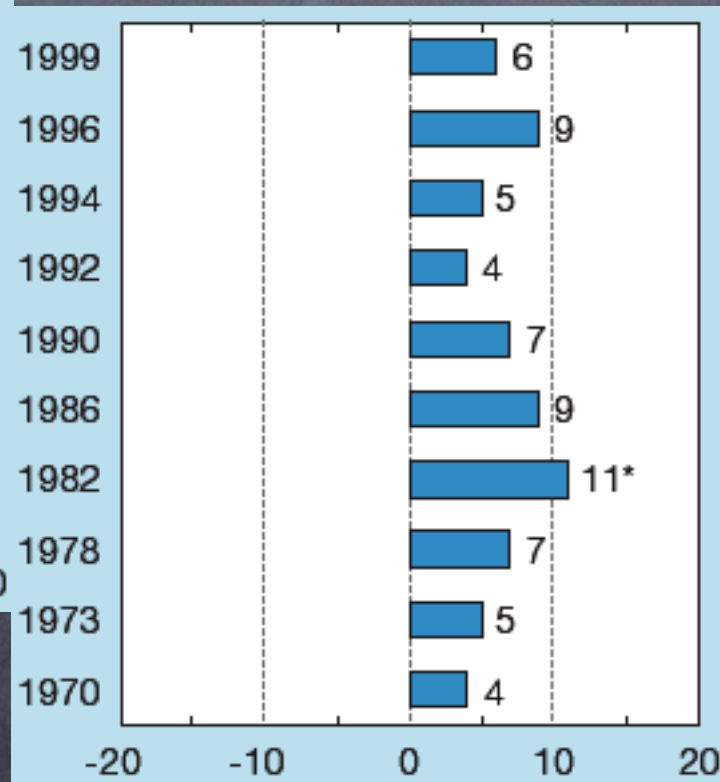
NAEP Gender Differences

*Graphs show
male-female
score difference

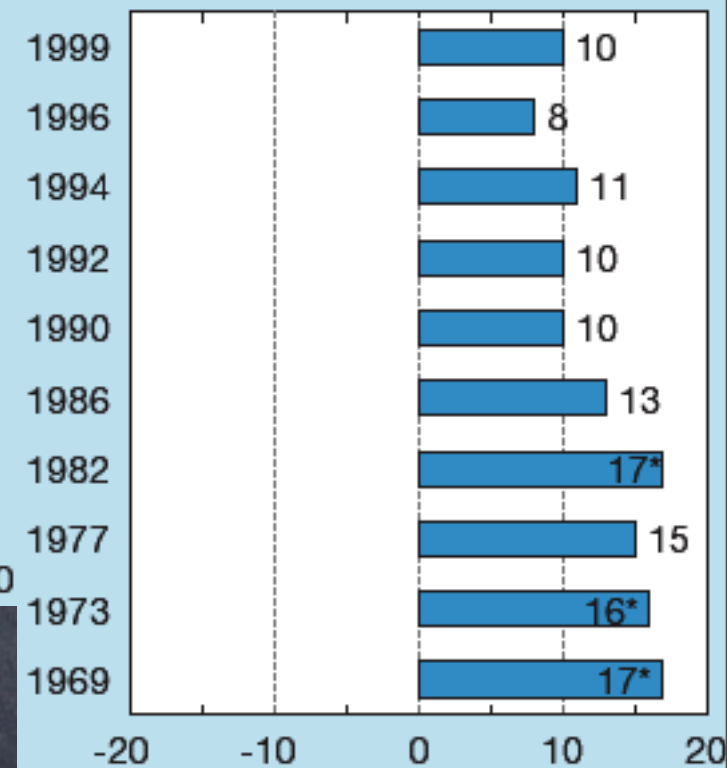
Age 9



Age 13



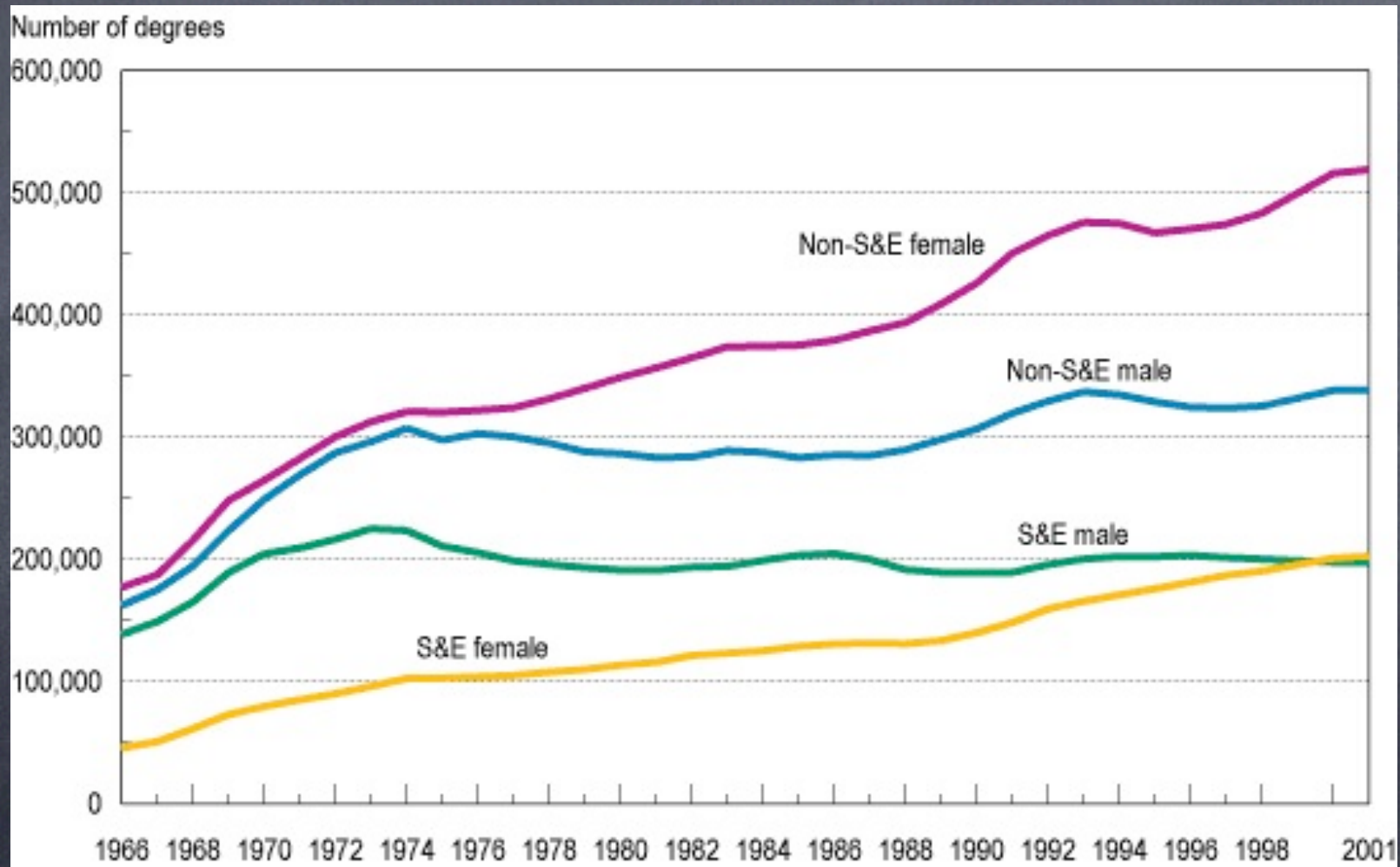
Age 17



HS Course-taking patterns

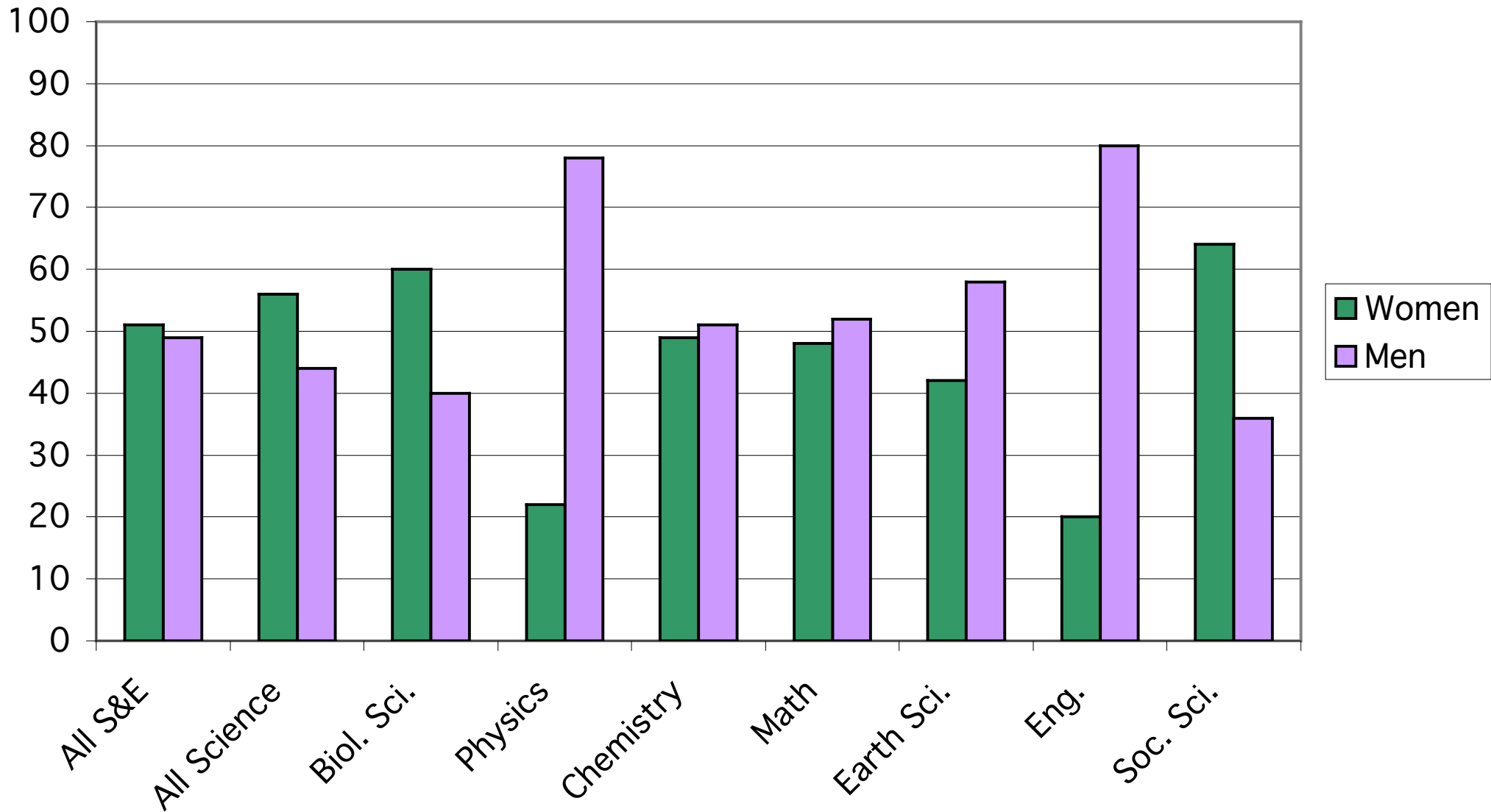
	Males	Females
Bio	37	29
Bio/Chem	32	42
Bio/Chem/ Phys	31	29

Number of Bachelors Degrees Awarded 1966-2001



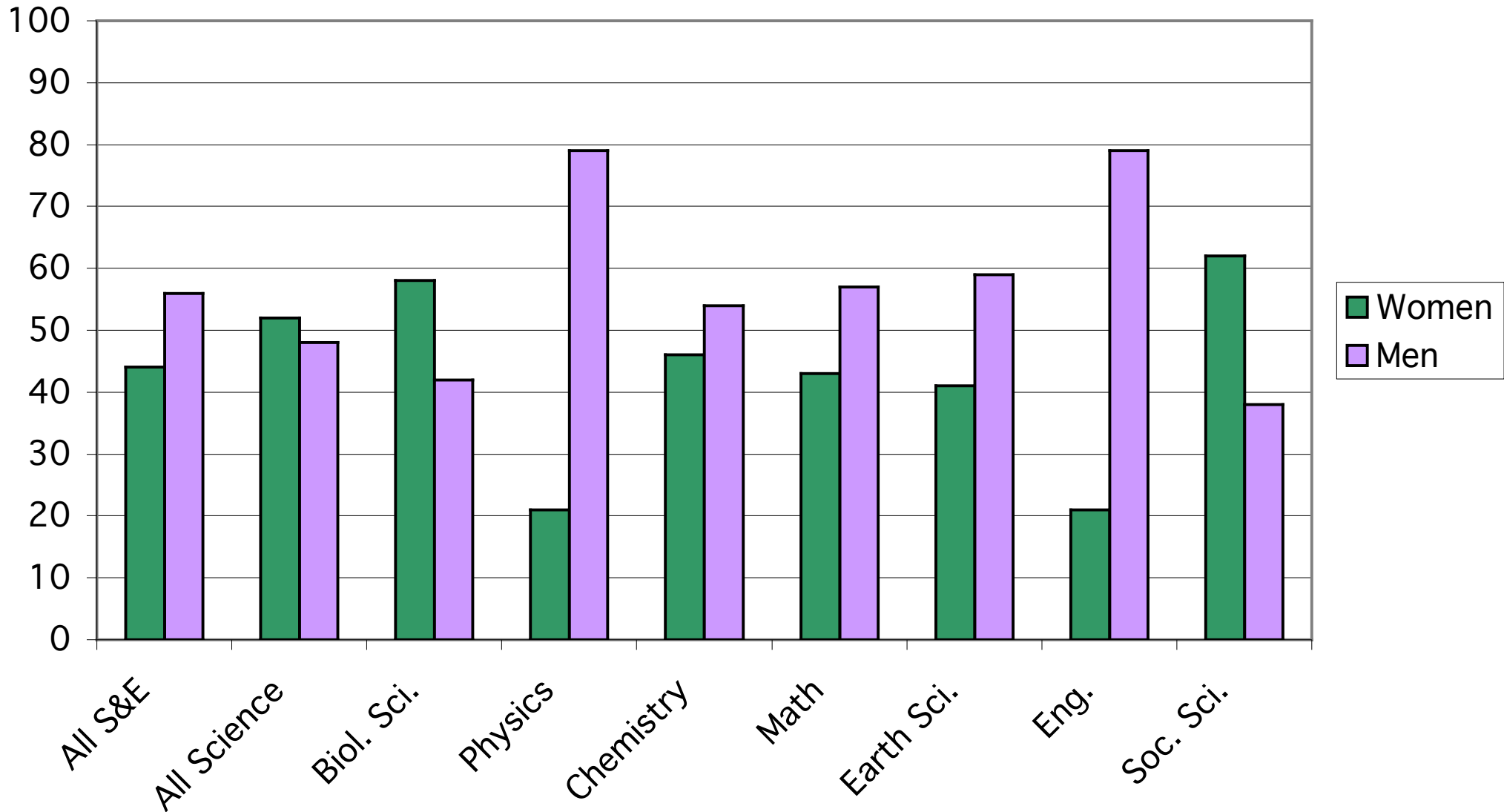
National Science Foundation, Division of Science Resources Statistics, Women, Minorities, and Persons with Disabilities in Science and Engineering: 2004, NSF 04-317 (Arlington, VA, 2004; updated May 2004). Available from <http://www.nsf.gov/statistics/women>.

Percent of bachelors degrees by gender



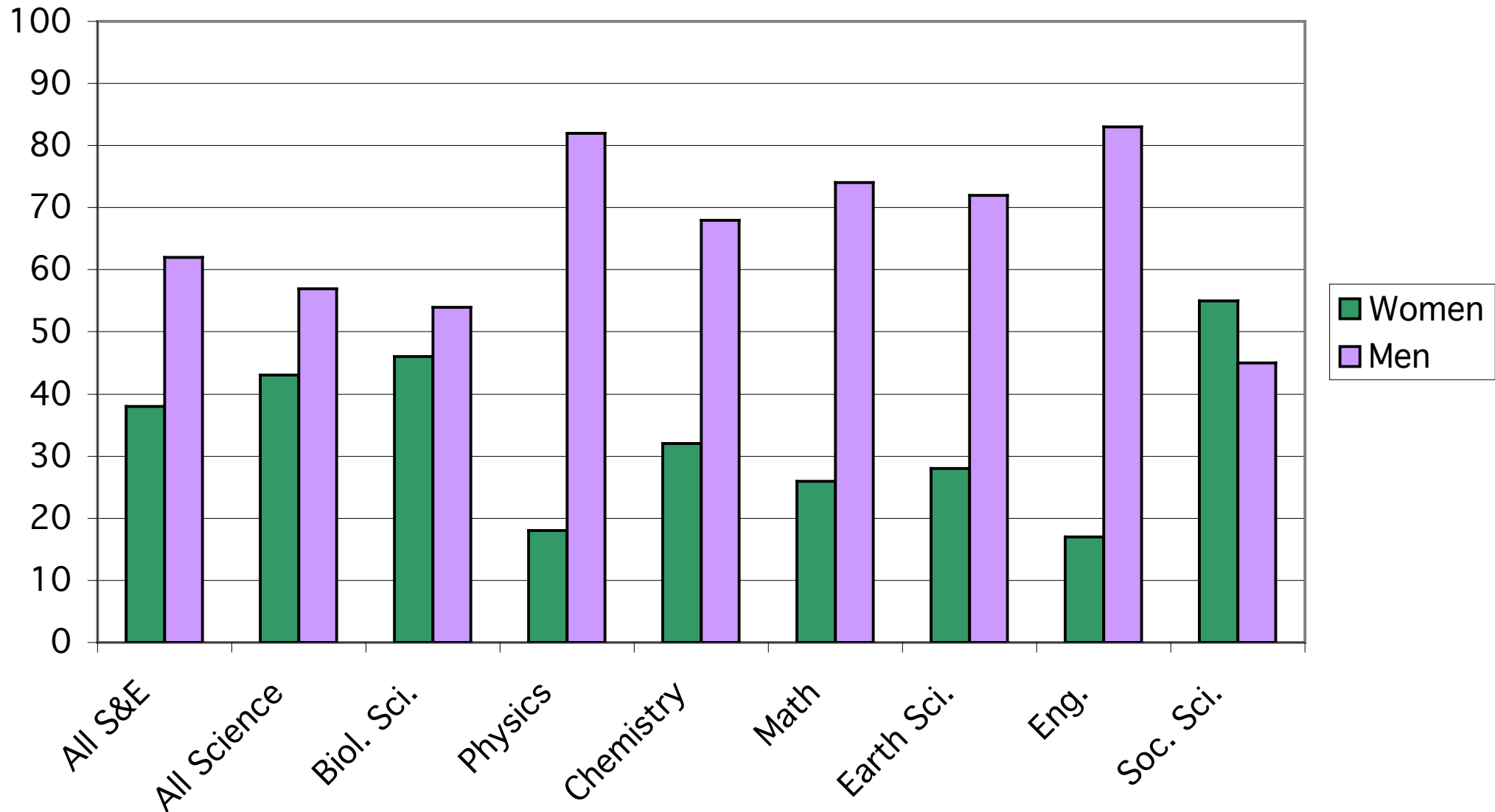
NSF Women & Minorities Report: 2001 data

Percent of masters degrees by gender



NSF Women & Minorities Report: 2002 data

Percent of doctorates by gender

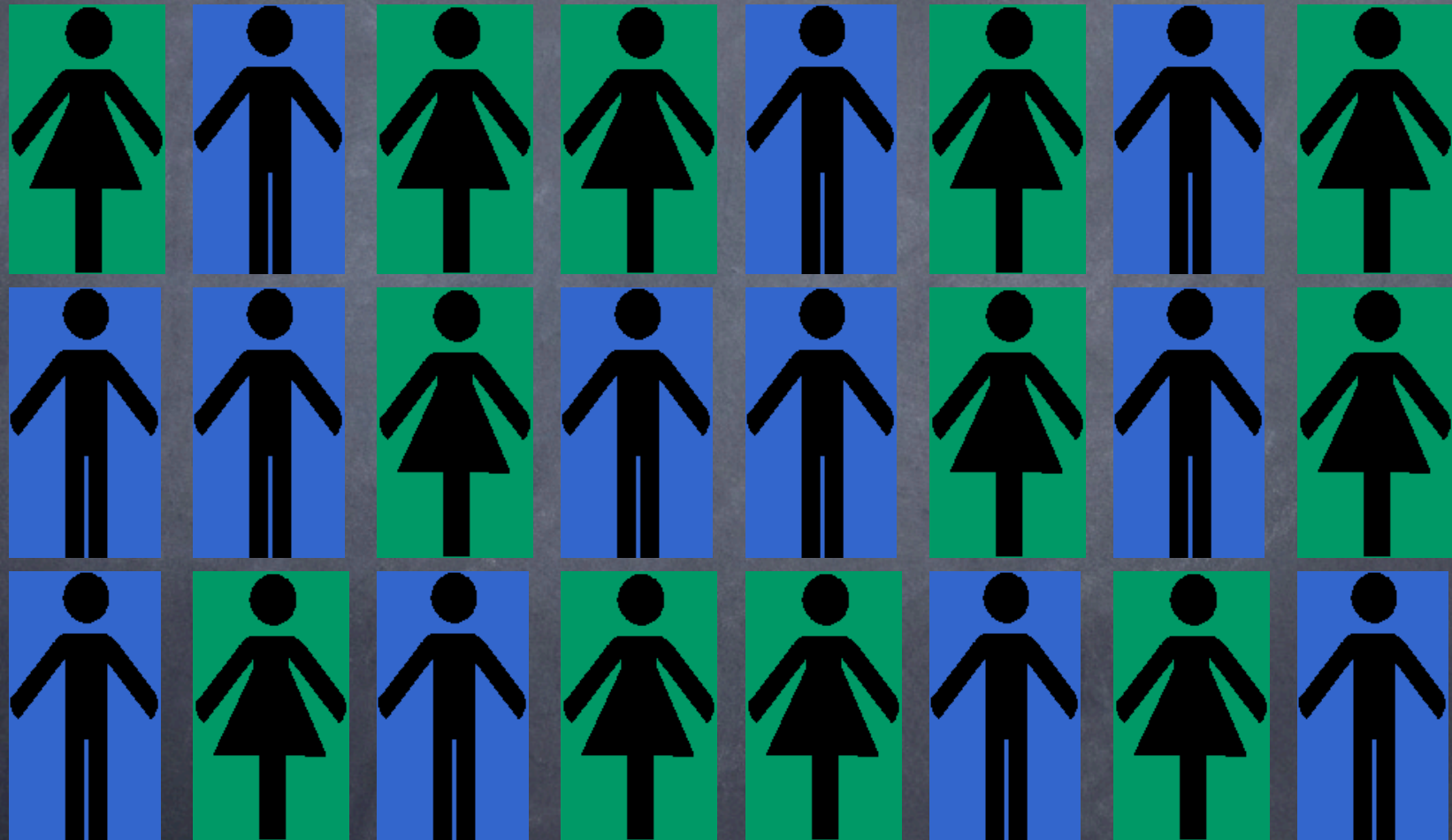


NSF Women & Minorities Report: 2003 data

In physics...

- How does physics compare to the sciences overall?

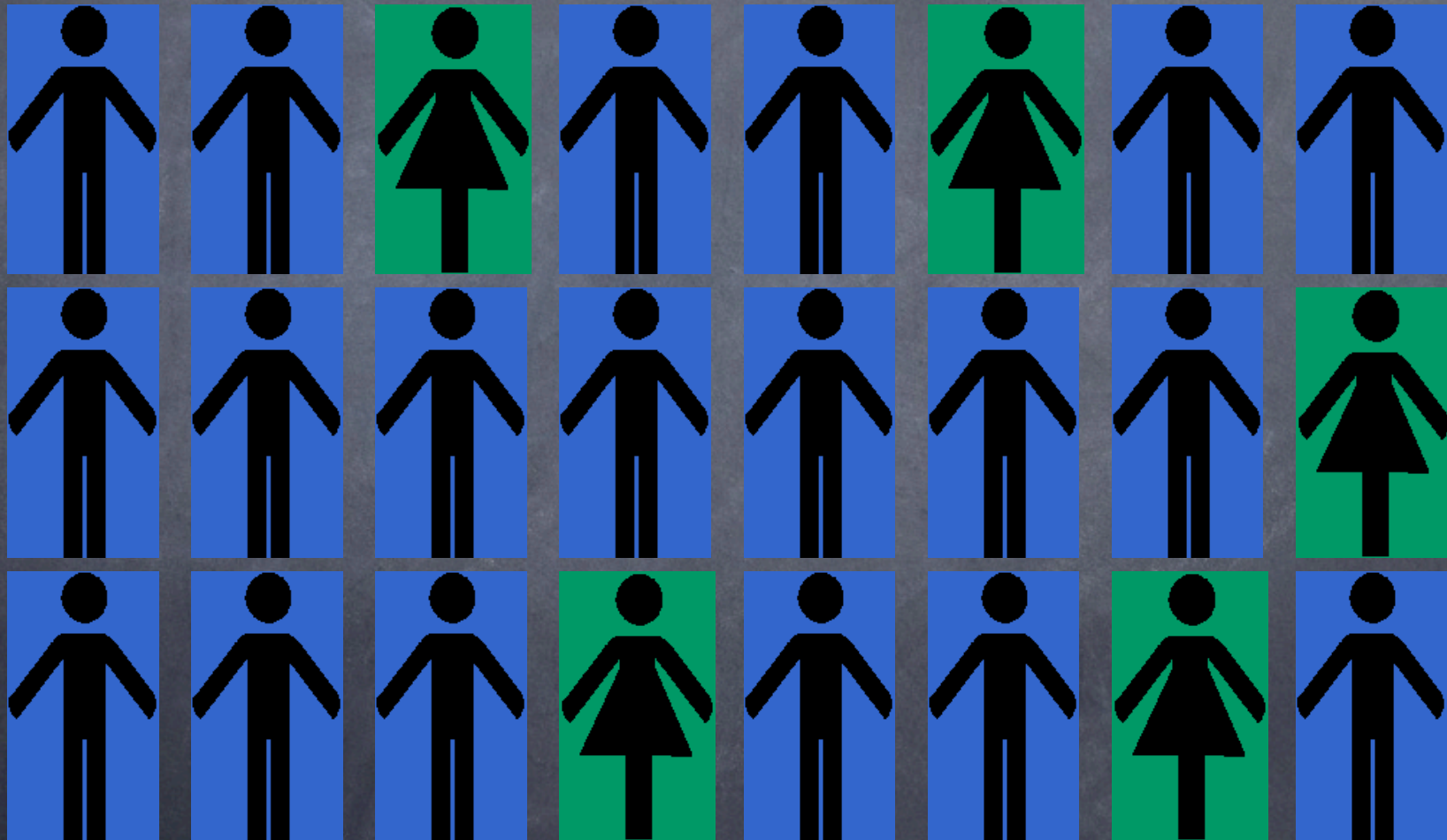
High School Physics



High School Physics

- 50% of high school physics students are women!
(28% of students take HS physics)
- But...
- Women are still not found in the AP courses which are better preparation for college coursework

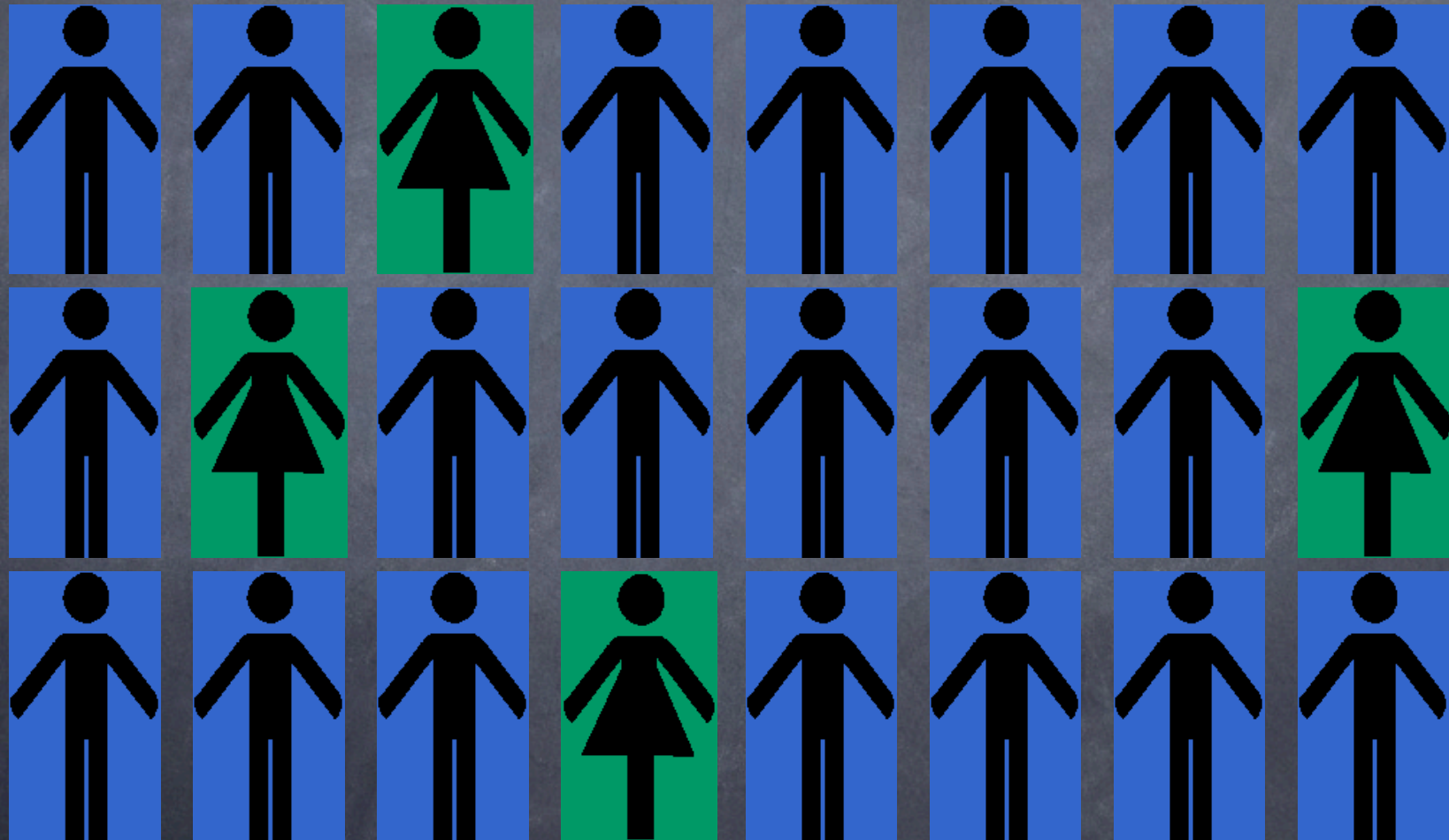
Undergraduate Physics



Undergraduate Physics

- Women make up ~31% of two-year college physics students
- Women receive 22% of physics bachelors degrees

Graduate Physics



Graduate Physics

- Women receive 21% of master's degrees in physics
- 18% of physics doctorates go to women
- Is this a problem? Yes!

What Now?

- Our society needs every science-minded individual in the science workforce
- Every student, male or female, should understand science
- We need to address gender inequity in the STEM classroom

AAAS/Project 2061 Benchmarks

- 1C: The Scientific Enterprise; Grades 6-8
- "Until recently, women and racial minorities, because of restrictions on their education and employment opportunities, were essentially left out of much of the formal work of the science establishment; the remarkable few who overcame those obstacles were even then likely to have their work disregarded by the science establishment"

National Science Education Standards

- History and Nature of Science, Grades 5-8, Science as a Human Endeavor
- "Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others."

NCTM Principles and Standards for School Mathematics

- Too many students--especially students who are poor, not native speakers of English, disabled, female, or members of minority groups--are victims of low expectations in mathematics. The Equity Principle demands that high expectations for mathematics learning be communicated in words and deeds to all students.


- What can we do to encourage women? Start by thinking about the barriers young women encounter in science

Barriers to girls and women


- Peer culture
- Peer harassment
- Bad counseling and advice
- Sexism from administrators and teachers
- Lack of female teachers/role models
- Parental influence
- Classroom culture of sexism

Gender and teaching


- Problem: science/math classrooms are not gender-neutral
- Curriculum, Instruction, Assessment



Few pictures of female scientists or mathematicians in textbooks



Always calling on boys, using male examples and pronouns



Male-oriented questions and contexts

Possible solutions?

- Issues of gender in the STEM classroom exist
- What solutions can help to address these issues?

Curriculum

- Get new editions of texts which include female role models
- Use a variety of curricular activities to include all types of learners: visual, mathematical, textual, aural
- Include biographies of prominent persons
- Read research from males and females

Instruction

- Be observed. Get a colleague to sit in your class and watch for gender discrepancies (count who gets called on, who is spoken to, who is reprimanded, etc.) Videotape also works.
- Choose groups instead of letting them self-select. Use personality, gender, and performance to pick groups that will encourage girls to participate.
- Bring in guest speakers as role models

Assessment

- Write/choose assessments that use examples familiar to both males and females
- Use multiple assessment types: multiple-choice, problem-solving, short and long essay, projects, etc.
- Make sure that test questions that refer to people use both genders and don't stereotype; even better, always use "you"

Overall classroom

- Some research support for cooperative and student-centered, active-learning classrooms providing better environment for young women and girls

Application, not theory

- Female interest in science tends to be driven by what it can do; not science for its own sake
- Bringing science applications in can help girls get interested in science

What else?

- Advocates: one fervent supporter
- Role models
- Good advising
- Educate counselors, principals, administrators
- Do not stereotype by gender in language or other communications

Conclusion

- Girls and women make up a minority in science and engineering today
- The STEM classroom can have a large effect on girls' interest in science—positively or negatively
- We should all be aware of the issues surrounding gender and the STEM classroom