

Gender and Science Learning

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Women and Science

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

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"

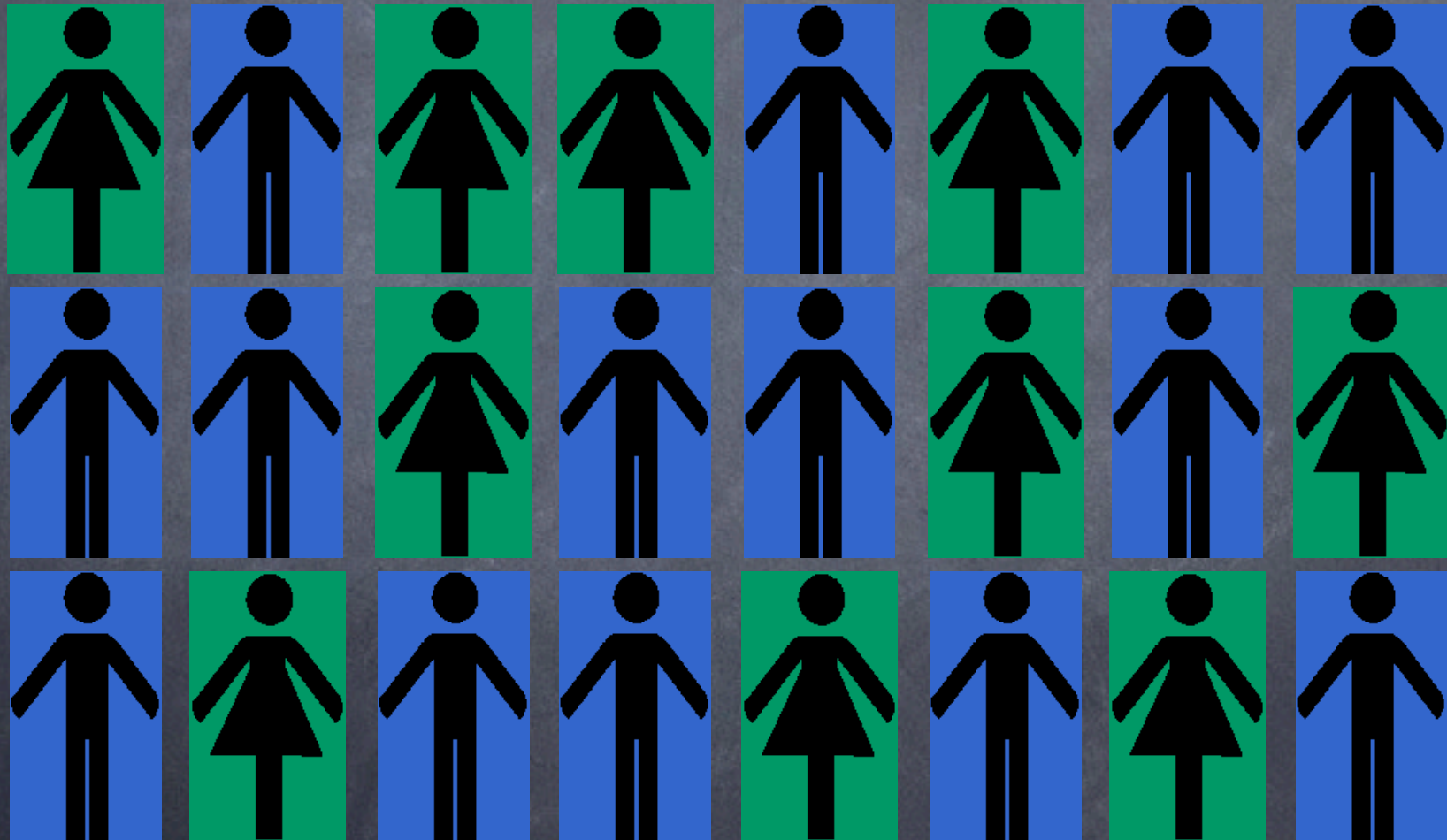
National Science Education Standards

- 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."

Discussion

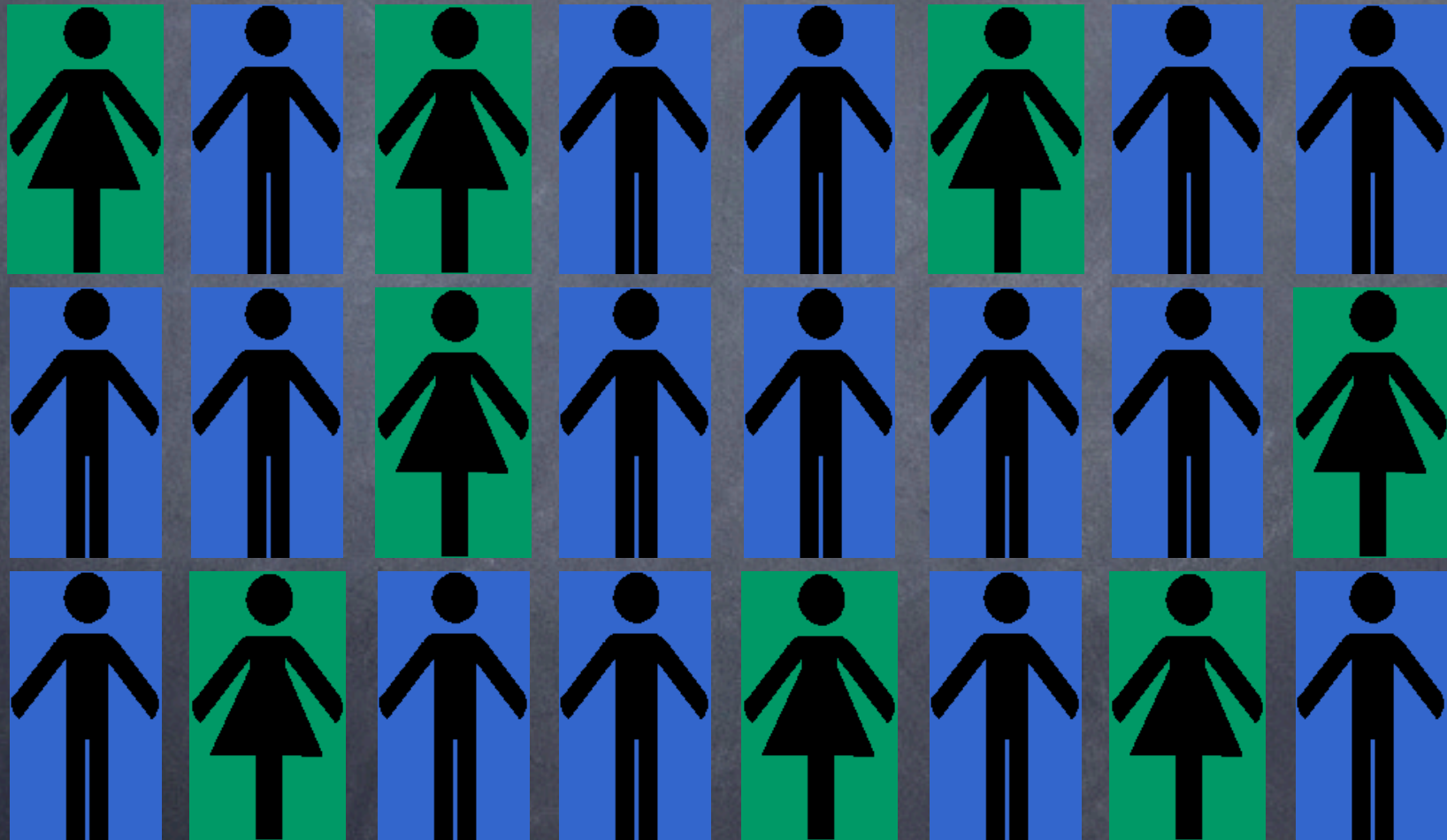
- What is the gender ratio of students in your classrooms? Of science teachers in your school?

Women and physical science—Bachelor's



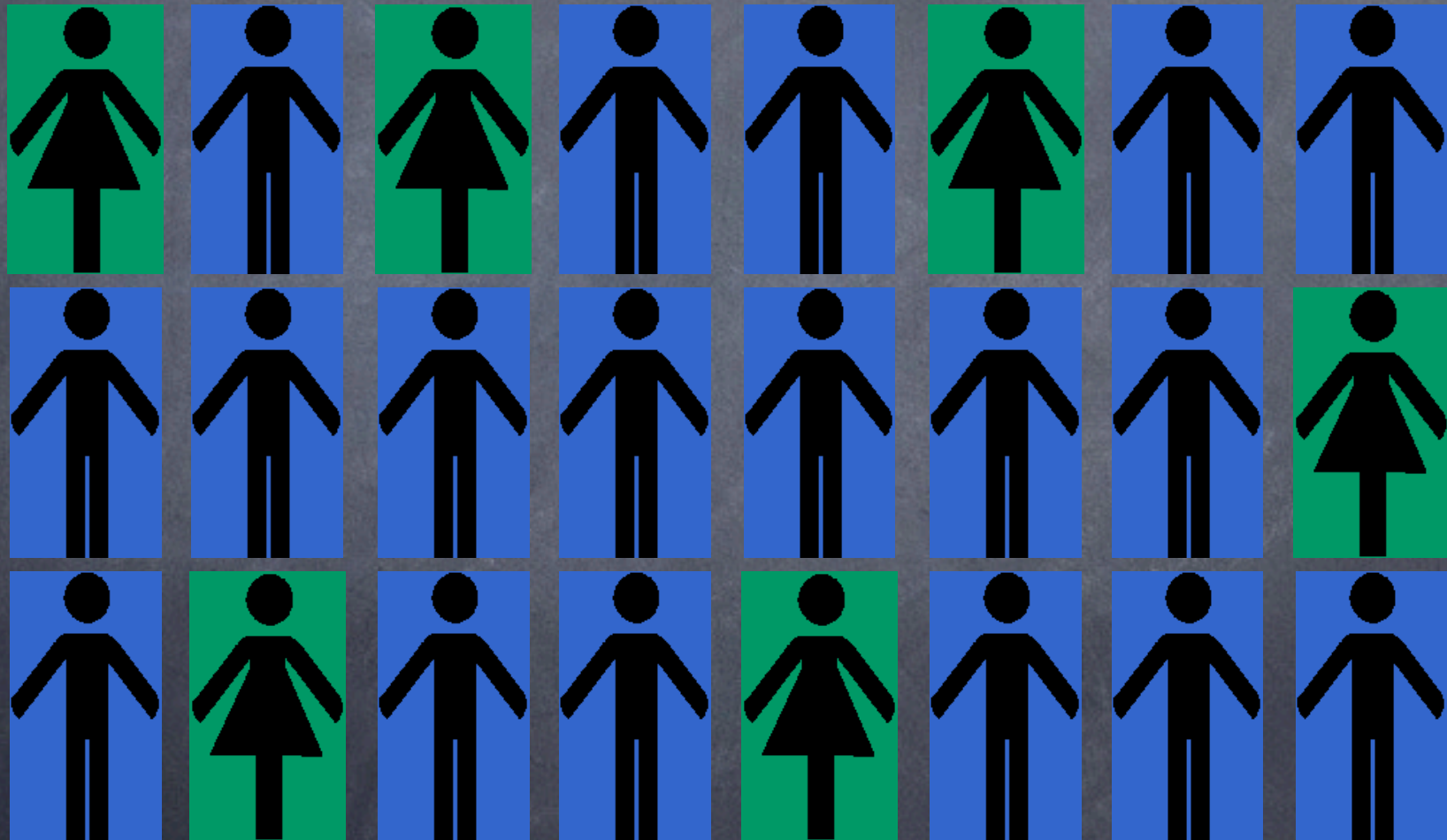
41%

Women and physical science—Master's



35%

Women and physical science—Doctorate



25%

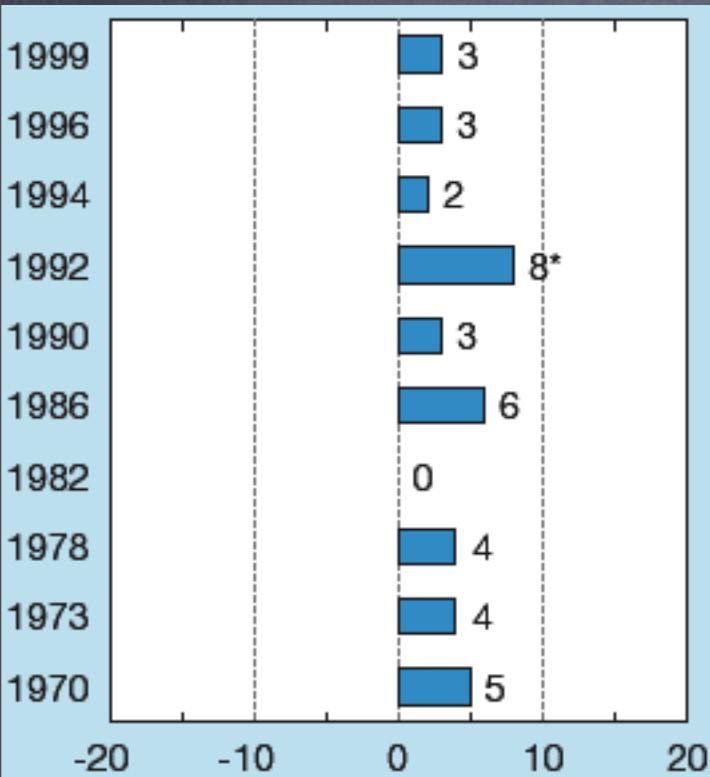
NAEP

- 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

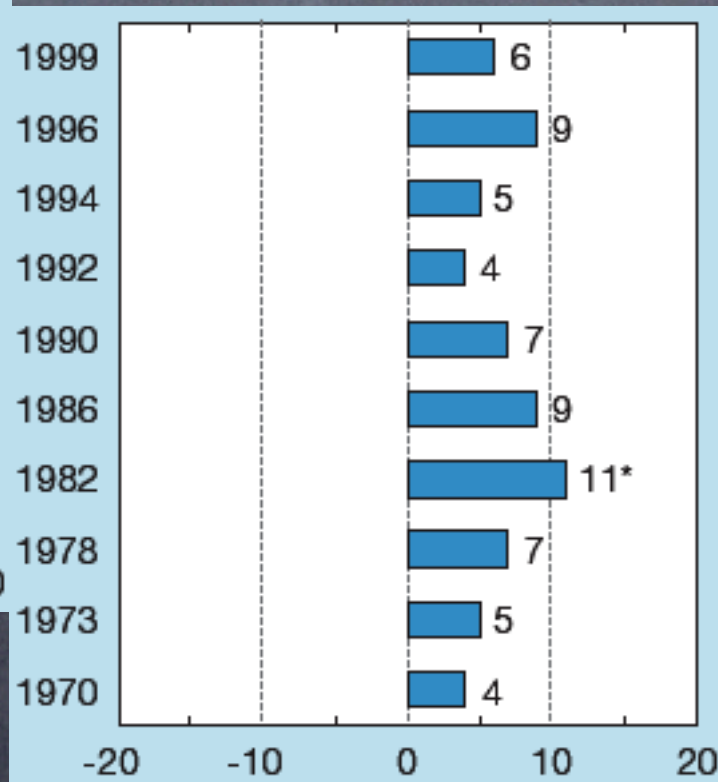
NAEP Gender Differences

*Graphs show male-female score difference

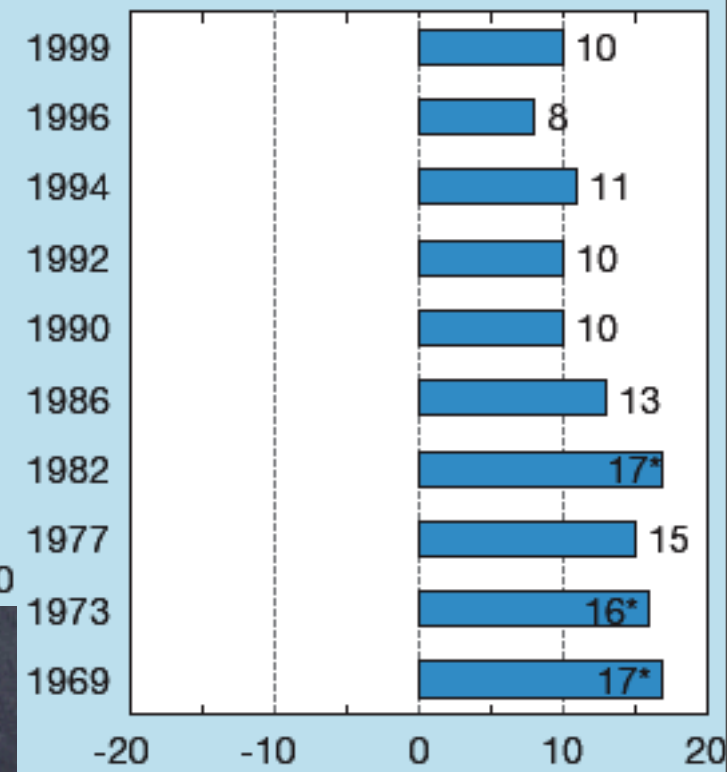
Age 9



Age 13



Age 17



Historical Perspective

- The numbers of women in physical science have been increasing steadily over the last 50 years
- We're not at parity, but we've gotten a lot closer

Discussion

- Do you think that women have always been a minority in science? Can you think of a time when science education included women?

Historical Comparisons

- Has science always been a male dominated field?
Have women ever studied science?
- Prior to the twentieth century, high schools and colleges had distinctly different curricula for their young ladies and gentlemen.
- In fact, the women's curriculum was heavy on science while the men's curriculum leaned toward the "classics" like literature, Greek, and Latin

School Curricula

% of NC & VA schools advertising science 1800-1840

	Natural philosophy	Astronomy	Chemistry	Botany	Mineralogy	Natural history
Girls' schools	74	47	54	35	5	13
Boys' schools	47	22	21	2	3	1

Classics vs. Science

Courses offered by gender at a NC academy, 1837

Spelling, Reading, Writing, Grammar	Spelling, Reading, Writing, Grammar
Geography	Geography
History	History
Arithmetic	Arithmetic
Rhetoric	Rhetoric
Logic	Logic
French	French
Latin	Nat'l philosophy
Greek	Chemistry
Algebra	Astronomy
Geometry	Botany
Navigation	Nat'l theology
Surveying	Drawing/painting
	Elements of Criticism

Males

Females

Why was science mostly for women?

- Men's college requirements were classically oriented; science was a low-esteem field; boys' schoolmasters taught what they were taught; no science jobs
- Women's schools were too new to have established a "traditional" curricula
- Women served to popularize science, increase attendance at science lectures, and served as unpaid assistants to museum curators and researchers

Why science education for the ladies?

- Women's academies were privately funded and could teach whatever they chose; many could also afford expensive science equipment
- Home science/home economics was an acceptable place for women in science; men were unlikely to advise women in such a female occupation; women were nutrition researchers, bacteriologists, chemists, biologists, etc. because these were viewed as part of the women's sphere

A Wisconsin example

- In 1868, the University of Wisconsin closed its "normal" college (teaching college) and instead opened the doors of a "female" college
- The curriculum was designed to serve young women in those subjects deemed most appropriate

Univ. of Wisconsin 1868-69

- Science requirements at the female college:
 - Geography freshman year
 - Botany and Physiology sophomore year
 - Zoology junior year
 - Chemistry, Astronomy and Geology senior year

University of Wisconsin

- About the same time, the University of Wisconsin also allowed women to enter its regular College of Arts & Letters and to receive a Bachelors of Arts degree which was equivalent (though not identical) to the men's degree

UW Bachelors of Arts for Women

- The women's Bachelors degree (ever think about the irony of women getting a bachelor's degree?) had seven required science classes!
- Botany sophomore year
- Chemistry, Anatomy, Zoology, and Physics junior year
- Astronomy and Geology senior year

What happened?

- As science gained prestige and classical studies became less fruitful (particularly in terms of employment), men took over science courses
- Today, men form the majority in physical science though women are still found in substantial numbers in "female" sciences such as food & nutrition and biology and veterinary medicine

What Now?

- Our society needs every science-minded individual in the science workforce
- Every student, male or female, should understand science
- What can we do to encourage women? Start by thinking about the barriers young women encounter

Discussion


- What barriers do you think young women encounter in science classrooms, society, and other environments?

Barriers to women


- Peer culture
- Peer harassment
- Bad counseling and advice
- Sexism from administrators and teachers
- Classroom culture of sexism
- Lack of female teachers/role models (25%)
- Parental influence

Gender and science teaching


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



No pictures of female scientists in textbooks



Always calling on boys, using male examples and pronouns



Male-oriented questions and contexts

Discussion

- Curriculum: What can you/do you do with your curriculum to promote gender equality in your classroom and school?

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

Discussion

- Instruction: What can you/do you do with your instruction to promote gender equality in your classroom and school?

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 allow girls to participate.
- Bring in guest speakers as role models

Discussion

- Assessment: What can you/do you do with your assessment to promote gender equality in your classroom and school?

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"

An example of a gender-friendly curriculum piece

- CIPS is a middle-school physical science curriculum that uses science fiction as a hook and as a teaching tool
- Science fiction storyline has four main characters (aliens): Stas, Kinet, Teract, and Modulus
- The creation of these characters involved considering how best to appeal to males and females as well as diverse personalities

Stas



Female, quiet and precise;
Likes studying and learning;
Trade historian by training;
Records officer on the ship
Solar Wind

Kinet



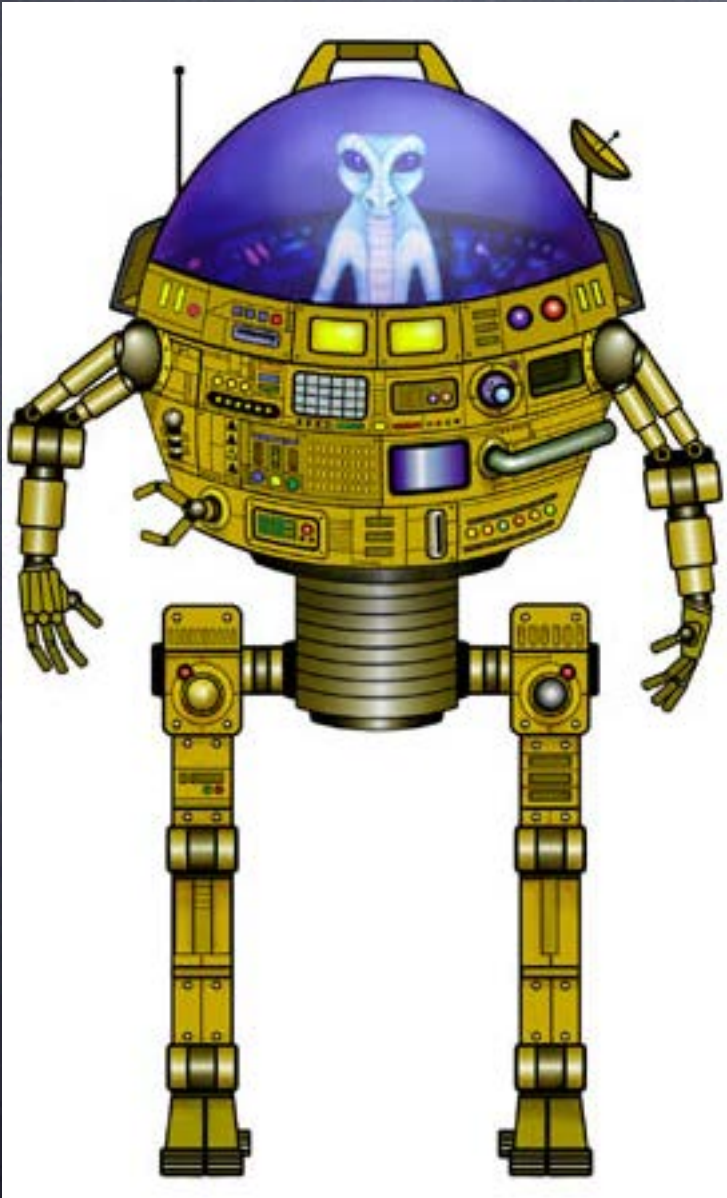
Male, enthusiastic, youthful;
Curious, scattered, bold,
Optimist
Pilot on the ship Solar Wind

Teract



Female, active and athletic;
Good at communications;
Mission command officer on
the ship Solar Wind

Modulus



Male; organized and logical;
Weak body in strong suit;
Engineering officer on the
ship Solar Wind

Diverse appeal

- This is one way to help girls feel part of the science community
- Bringing science applications in can also help girls get interested in science

Conclusion

- Girls and women make up a minority in physical science today
- Yet, historically girls were taught more science than boys
- As teachers we 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 science classroom