Promoting Women’s Participation in Physics

Laura McCullough
Physics Department
University of Wisconsin-Stout
Overview

Current status of women in physics
Recruiting women
Retaining women
Women’s Education

Women receive

about half of all high school diplomas,

over half of all bachelor’s degrees (57%),

59% of master’s degrees, and

45% of doctorates

What about physics?

Data from http://caspar.nsf.gov (NSF and NCES sources)
High School Physics

46% of high school physics students are female!
(31% of students take HS physics)

But...

Girls are still less likely to be in the AP courses which are better preparation for college coursework

Women make up ~31% of two-year college physics students*

Among 25-year old college attendees who have had physics, 37% are female**

Women receive 22% of physics bachelors degrees***


***Data from http://caspar.nsf.gov (NSF and NCES sources)
Graduate Physics
**Graduate Physics**

- 21% of first-year graduate students are women*

- Women receive 21% of master’s degrees in physics**

- 18% of physics doctorates go to women*

---


**Data from http://caspar.nsf.gov (NSF and NCES sources)
Teaching positions

29% of high school physics teachers are women*

16% of adjunct/instructors in physics are women**

16% of assistant professors in physics are women**

11% of associate professors in physics are women**

5% of full professors in physics are women**


The Problem: Under-representation

- Severe under-representation of women in physics
- Need scientifically literate public and technological/scientific workers
- Need to be working to keep women
- Need to be doing research on how to keep women
Recruitment

First step: get women interested, get them into physics classes, get them into the major

What helps interest women?
Pedagogy to attract

What Works? project:
More than one student cited an innovative teaching approach as a reason to major in physics

Grinnell College: Changing pedagogy in intro courses draws more women


Retention

- Once in physics, we need to keep the women
- What can we do in our classes to help retain women in a class and in a major?
Pedagogy for retention?

- Can the way we teach affect women’s participation?
- Can good teaching help us retain women?
- Does bad teaching hurt retention?
Bad pedagogy

“Reports of poor teaching in S.M.E. classes were by far the most common complaint of all switchers and non-switchers.”

Pedagogy was third-highest rated reason for leaving science

Science teachers less likely to use active learning techniques; more likely to grade on curve

Pedagogy to retain

**Workshop Physics:**
Younger college women → positive experience
More senior college women → more likely to feel negative about the interactive course structure

**SCALE-UP:**
Women were almost five times as likely to pass a SCALE-UP course than a traditional course

---


---

Wednesday, October 13, 2010
Pedagogy to retain

Rutgers University:
“Extended General Physics” course with more interactive pedagogy helps women stay in the course; 1% drop compared with 11% drop in regular course

“Individual differences between students far outweighed gender differences”

Reform pedagogy to help women

Long-range study at Harvard; traditional teaching, mixed-pedagogy, and interactive engagement

Interactive engagement reduced significant gender gap on conceptual test to no gap

“No observed loss of achievement among the male students.”

What else works?

- Faculty support structure: family-friendly policies, mentoring, research support
- Warm, inclusive departmental culture
- First year advising, good first year teaching
- Four-year mentoring

What else works?

- Spend money on students (lounge, tutors, lab assistants, seminars, SPS, socials)
- Female-friendly department
- Invite alumni and alumnae back
- Students help create culture

What else works?

- Need familiar, positive interactions between faculty and students
- Can’t get too personal though!
- Don’t serve as poor role models (students need to see work-life balance)

Committee on the Status of Women in Physics will visit R1 graduate departments

Interview students, faculty, staff

Make recommendations on improving departmental climate
Conclusions

- Women still under-represented in physics
- Recruitment and retention are both important in getting women into physics
- Better pedagogy, welcoming culture keys to getting and keeping women in physics