Increasing Diversity in Computing Research

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outline

- Why I am nervous about this talk
- Current data on diversity at B.Sc., M.Sc., Ph.D from the Taulbee Report
- Why diversity matters
- Examples of institutions of all types that have moved the needle for women
- What works
- Access to $$$$$
- Q & A

Why I am nervous about this talk

- HMC, CMU not seen as good models for most institutions

- CS departments currently overloaded with majors already

- Hard to believe that simple changes can have a big impact

12-13 Taulbee data on women receiving degrees (CE lower than CS except M.Sc.)

CS

- B.Sc.   14.2%
- M.Sc.   21.2%
- Ph.D.   17.2%

Information

- B.Sc.   18.7%
- M.Sc.   47.1%
- Ph.D.   39.8%

12-13 Taulbee data on African-Americans receiving degrees (CE similar to CS)

CS

- B.Sc.   3.8%
- M.Sc.   1.0%
- Ph.D.   1.5%%

Information

- B.Sc.   8.0%
- M.Sc.   5.9%
- Ph.D.   1.8%

12-13 Taulbee data on Hispanics receiving degrees (CE similar to CS)

CS

- B.Sc.   6.0%
- M.Sc.   1.2%
- Ph.D.   1.4%%

Information

- B.Sc.   9.4%
- M.Sc.   4.2%
- Ph.D.   1.8%

Why it matters

- Great career opportunities
- Our economic future
- Diverse teams produce better solutions

Some institutions moving the needle for women

Cal Poly SLO	U. British Columbia U. Washington
CMU GeorgiaTech HMC MIT	Stanford

Progress with women at B.Sc.

- CalPoly SLO incoming class 2009 to 2014, 10% to 27%
- UBC, CS grads 1997 to 2002, 15% to 27% (now too)
- UW, CS grads 2005 to 2014, 15% to 30%
- CMU, CS majors 1995 to 2000, 8% to 38% (now too)
- GeorgiaTech, Computational media 30%
- HMC, CS majors 2006 to 2010, 10% to 40% (now too)
- MIT, now 30% in CS, 62% in comp bio
- Stanford, declare CS major 2007 to 2012, 10% to 25%

CalPoly, 10% to 27% in 5 years

- Champion: dept chair Ignatios Vakalis
- Constraints: admit to major, not allowed to convert other majors or see applicants, budget cuts, no scholarships by gender
- Changes:
  - Revamped first course
    - Different flavors of first course by applications
    - project-based, group pedagogies
  - High school outreach
    - Female students recruiting at high schools
    - Phone calls to admitted females by female students

Changes at CalPoly continued

- Building community
  - Mentoring, peer to peer and with industry advisory board members
  - Support for "women in computing" student club
  - Taking first year and upper year female students to Hopper (70 this year)
- "women in computing" is a top strategic department priority that all faculty contribute and support (in different ways/levels)

UW, 15% to 30% in 9 years

- Champion: Ed Lazowska, former dept. chair
- Constraints: large research intensive public university; budget cuts
- Changes:
  - Revamped first two courses to emphasize:
    - Support for all students, instilling confidence
    - Breadth of applications of CS to other disciplines
    - Emphasizing community

UW changes continued

- Outreach to high schools
  - CS4HS professional development for teachers
  - Recognizing teachers nominated by strong students
  - Hosting NCWIT aspire to computing awards
  - STEM Out!, summer camps marketed to girls
- Building community
  - ACM-W chapter
  - Taking students to Hopper

HMC, 10% to 40% in 4 years

- Champions: Christine Alvarado, Zach Dodds, Geoff Kuenning, Ran Libeskind-Hadas,
- Constraints: competitors for students are much better known and wealthier
- Changes:
  - Revamped first course to emphasize:
    - CS framed as creative problem solving using computational approaches with Python
    - Building confidence through different sections, reduced macho behavior
    - Breadth of applications of CS to other disciplines
    - Teamwork, pair programming
    - Choice of homework assignments

HMC changes continued

- Changed next two courses along similar lines
- Encouraged students to take the next course
- Building community
  - Taking students to Hopper
  - Early research opportunities
  - Hiring passionate female faculty (now 5 of 13)
- Outreach to high schools to increase % female over all
  - Revamped brochures
  - most tour guides are female
  - Hand-written cards to admitted females

Getting from 10% to 40% at HMC

- Female students at HMC over all:
  - 22% in 1997
  - 32% in 2006
  - 42% in 2010
  - 46% in 2013
  - Entering class in 2012, 2013 is 48% female
- Female faculty at HMC over all:
  - About 20% in 1997
  - 33% in 2006
  - 40% in 2010
  - 36% in 2014

Why these approaches work

- Young women don't want to major in CS because:
  - They think it's boring
  - They think they won't be good at it
  - They think they won't fit in because computer scientists are dorks with no life

Why these approaches work

- Young women don't want to major in CS because:
  - They think it's boring
    - Revamp intro courses
    - Emphasize breadth of applications of CS
    - Frame as creative problem-solving
  - They think they won't be good at it
    - Build confidence, team work, support
  - They think they won't fit in because computer scientists are dorks with no life
    - Build community, take students to Hopper

Do the same changes work for students of color?

- Some early indications at HMC:
- Rising sophomores over all:
  - 6% African American
  - 12.5% Hispanic
- Students in second CS course last semester:
  - 3.6% African-American
  - 14.5% Hispanic

Univ. Illinois at Chicago

- Champion: Robert Sloan
- 12.5% Hispanic in CS major!

Q&A