Increasing Diversity in Computing Research

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• 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.)**

<table>
<thead>
<tr>
<th>CS</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>• B.Sc.  14.2%</td>
<td>• B.Sc.  18.7%</td>
</tr>
<tr>
<td>• M.Sc.  21.2%</td>
<td>• M.Sc.  47.1%</td>
</tr>
<tr>
<td>• Ph.D.  17.2%</td>
<td>• Ph.D.  39.8%</td>
</tr>
</tbody>
</table>
12-13 Taulbee data on African-Americans receiving degrees (CE similar to CS)

<table>
<thead>
<tr>
<th>Degree</th>
<th>CS</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc.</td>
<td>3.8%</td>
<td>8.0%</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>1.0%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>1.5%</td>
<td>1.8%</td>
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12-13 Taulbee data on Hispanics receiving degrees (CE similar to CS)

<table>
<thead>
<tr>
<th>CS</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>• B.Sc. 6.0%</td>
<td>• B.Sc. 9.4%</td>
</tr>
<tr>
<td>• M.Sc. 1.2%</td>
<td>• M.Sc. 4.2%</td>
</tr>
<tr>
<td>• Ph.D. 1.4%</td>
<td>• Ph.D. 1.8%</td>
</tr>
</tbody>
</table>
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
Georgia Tech
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