Diversity in Undergraduate Education in Computer Science

Maria Klawe
Harvey Mudd College
Outline

• The diversity and inclusion journey at Harvey Mudd
• Making the CS major accessible and engaging
• CS curriculum for non-CS majors
• Scaling the CS faculty?
• Discussion
Harvey Mudd College?

- Tiny science and engineering liberal arts college (800 students, 90 faculty)
- One of 5 undergraduate Claremont Colleges
- Competes with MIT, Caltech and Stanford for students
- Student values: honor code, helping others, challenge, hard work, humility
- Faculty values: educating our students, excellence and innovation in teaching and curriculum, research with undergraduates, hard work
- Most expensive college in USA, ranked #1 for ROI for last 4 years (80% of students receive some financial aid, high salaries after graduation)
HMC, founded in 1955 as coed, mostly white and male for 30 years
### Increase in female faculty and students 1996 to 2016

<table>
<thead>
<tr>
<th></th>
<th>1996</th>
<th>2006</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>faculty</td>
<td>~20%</td>
<td>~30%</td>
<td>~40%</td>
</tr>
<tr>
<td>students</td>
<td>~20%</td>
<td>~30%</td>
<td>~50%</td>
</tr>
</tbody>
</table>
Increase in student racial diversity, first year class 2012 to 2015

- African-American: ~1% to ~6%
- Hispanic: ~5% to ~20%
- Native Am./Pacific Is.: ~1% to ~3%
- International: ~10% to ~14%
- Asian-American: stable, 20 to 25%
- Caucasian: steadily decreasing, now about 40%
Increase in faculty racial diversity?

• Much slower
• Fairly steady progress, when attention slips progress disappears
• Critically important to educate search committees
Making the CS major accessible and engaging

• Hypothesis: if ...
  – you make the environment supportive and engaging for all,
  – build confidence and community among underrepresented groups
  – And demystify the path to success
a highly diverse population will come, thrive and succeed
Recommendations for intro course(s)

• Separate sections by prior experience
• Set expectation that hard work and asking for help lead to success
• Encourage collaborations, pair homework assignments
• Provide lots of support
• Ensure students have same ability to succeed at next course independent of prior experience
• Frame as creative problem solving with real life examples
• Eliminate macho behaviour
• Encourage students to take next course
Recommendations for next steps

• Ditto for next course(s)
• Provide early internships (industry) and research experiences
• Take students to conference with diverse attendees (e.g. Hopper, Tapia in US)
• Build community (clubs) and access to role models (faculty, speakers, mentors from industry)
CS Education for non-CS majors

- Computing influencing almost every discipline and profession
- Most CS curriculum designed for CS majors, too vertical for non-CS majors
- CMC-HMC initiative
Scaling the CS faculty

• Supply < demand, getting worse
  – Growth in students wanting CS education
  – Many CS Ph.D.s and faculty moving to industry

• Difficult to significantly increase Ph.D. output
  – Most undergrads choosing industry over grad programs
  – Lack of CS faculty

• Solutions?
  – The Stanford pilot, 1 yr M.Sc. program in CS education after Ph.D. in other area
  – Postdocs in CS for Ph.D.s using computing in their discipline