BOOMING ENROLLMENTS

Understanding the Surge

Student Enrollment

Tracy Camp

Colorado School of Mines
SEVERAL DISCUSSIONS/EFFORTS

CRA
NCWIT
ACM Ed Board
ACM NDC
NSF CISE
Questions for Institutions

Questions for Students
CRA COMMITTEE: INSTITUTION

Rick Adrion (UMass)
Tracy Camp (Mines)
Susan Davidson (Penn)
Mary Hall (Utah)
Susanne Hambrusch (Purdue)
Ellen Walker (Hiram College)
Stu Zweben (Ohio State)

Betsy Bizot (CRA)
Lida Beninson/Jan Cuny (NSF)
“OUR MASTERPIECE” (SURVEY)

- **goal**: measure, assess, and better understand enrollment trends and impact (on unit, on diversity, ...)

- **focus**: computer science (CS) undergraduate degree programs
THE PILOTS

Committee Members (2+)

Google CS Capacity Grantees
- Jeff Offut, George Mason
- Heather Pon-Barry, Mt. Holyoke
- John DeNero, UC Berkeley

Emily Grumbling (and others), CSTB

Anne Condon, UBC
DOCTORAL UNITS
131 of 188 submitted useful data
121 U.S. institutions
10 Canadian institutions
~70% response rate

NON-DOCTORAL UNITS
93 of ~700 submitted useful data
93 U.S. institutions
0 Canadian institutions
~13% response rate
SURVEY ANALYSIS

Increase in Major Demand
Increase in NonMajor Demand

Context
Public/Private, Size, Doctoral/Non

IMPACTS on
Students
Faculty & Staff
Diversity

Resources Available and Actions Taken/Rejected/Not Permitted
Majors
Taulbee: 2010 to 2015

133% ↑ in CS majors*
16% ↑ in T/TT faculty
86% ↑ in teaching faculty

*estimated
Cumulative Change in Majors and Full-time Instructional Faculty

- UG majors
- Teaching faculty
- T/TT faculty

Taulbee
Taulbee: 2010 to 2015

17% ↑ in CS Ph.D. Students
85% ↑ in CS M.S. Students

plus pressures from non-majors
CRA Enrollment Survey
CRA ENROLLMENT SURVEY

A. Preliminary Questions
B. Unit Context
C. Declaration/Admission to CS Major
D. Computing Courses for Non-Majors
E. Changes in Demand
F. Impact of Demand Increases
G. Data on Enrollment Changes in CS Courses
H. Unit/Data Reports
I. Data Use Permission
J. Final Comments
Course Enrollments

Intro Course (non-majors)
Intro Course (majors)
Mid-Level Course
Upper-Level Course

2005  2010  2015
NON-Majors
Mid-level Course Enrollment

- non-majors
- majors

(1 unit)
Mid-level Course Enrollment

(61 units)
Mid-level Course Enrollment

(61 units)

HUGE growth
Students in ‘Typical’ Mid-Level Courses
(in 44 units)

<table>
<thead>
<tr>
<th>Year</th>
<th>Nonmajors</th>
<th>Majors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1000</td>
<td>1500</td>
<td>2500</td>
</tr>
<tr>
<td>2010</td>
<td>1200</td>
<td>1800</td>
<td>3000</td>
</tr>
<tr>
<td>2015</td>
<td>3000</td>
<td>1500</td>
<td>4500</td>
</tr>
</tbody>
</table>
Public/Private

Large/Small
Mid-level Course Enrollment

large public (37)

2x

1x
Mid-level Course Enrollment

- Large public (37)
- Small public (26)

Graph shows enrollment trends over the years 2010 to 2015.
Mid-level Course Enrollment

- **large public (37)**
- **Canadian (4)**
- **small public (26)**

Graph showing enrollment trends from 2010 to 2015.
Mid-level Course Enrollment

- Large public (37)
- Canadian (4)
- Large private (12)
- ACM NDC (7 public and 25 private)
- Small private (6)
- Small public (26)

2010

2015

0 50 100 150 200 250 300
0 100 200 300 400 500 600
Mid-level Course Enrollment

- large public (37)
- Canadian (4)
- large private (12)
- ACM NDC (7 public and 25 private)
- small private (6)
- small public (26)

(117 units)
Impact
CRA ENROLLMENT SURVEY

A. Preliminary Questions
B. Unit Context
C. Declaration/Admission to CS Major
D. Computing Courses for Non-Majors
E. Changes in Demand
F. Impact of Demand Increases
G. Data on Enrollment Changes in CS Courses
H. Unit/Data Reports
I. Data Use Permission
J. Final Comments
To what extent are increasing UG enrollments impacting your unit?

- **Significant impact/challenges**
  - Doctoral depts: 70%
  - Non-doctoral depts: 30%

- **Impact**
  - Doctoral depts: 10%
  - Non-doctoral depts: 20%

- **Managing**
  - Doctoral depts: 10%
  - Non-doctoral depts: 30%

- **No impact**
  - Doctoral depts: 0%
  - Non-doctoral depts: 50%
TOP 5 Issues
Top 5 Issues

#1 - Classroom Space (77%)
#2 - Sufficient Faculty (69%)
#3 - Sufficient TAs (67%)
#4 - Faculty Workload (61%)
#5 - Office/Lab Space (55%)
TOP 5 Actions
Top 5 Actions

#1 - Increase class size (87%)
#2 - Increase # of sections (84%)
#3 - Increase use of UG TAs (77%)
#4 - Increase adjuncts/visitors (69%)
#5 - Have grad students teach (68%)
Top 5\textsuperscript{+1} Actions

#1 - Increase class size (87%)
#2 - Increase # of sections (84%)
#3 - Increase use of UG TAs (77%)
#4 - Increase adjuncts/visitors (69%)
#5 - Have grad students teach (68%)
#6 - Increase teaching faculty (65%)
Bottom 5 Actions
Bottom 5 Actions

#1 - Increase buyout costs or reduce buyouts (8.6%)
#2 - Spin off service courses (8.9%)
#3 - Raise bar for doing well in course (11%)
#4 - Increase teaching load (20%)
#5 - Increase online courses (21%)
Diversity
What % of units explicitly chose actions to assist with diversity goals?

15%

These units have a consistently higher % of females enrolled per Taulbee 2015 and across all four courses in our survey.
% female in courses surveyed (2005-2015)

- Intro (non-majors)
- Intro (majors)
- Mid-Level
- Upper-Level

(~40 units)
% female in courses surveyed (2005-2015)

2014-15 Taulbee: 16%

(~40 units)
% URM in courses surveyed (2005-2015)

- Intro (non-majors)
- Intro (majors)
- Mid-Level
- Upper-Level

(~32 units)
% URM in courses surveyed (2005-2015)

- Intro (non-majors)
- Intro (majors)
- Mid-Level
- Upper-Level

2014-15 Taulbee: 13%

(~32 units)
% URM in courses surveyed (2005-2015)

3x in raw numbers for URM

2014-15 Taulbee: 13%

(~32 units)
% URM in courses surveyed (2005-2015)

2.5x in raw numbers for all
3x in raw numbers for URM
5x in raw numbers for females

2014-15 Taulbee: 13%
(~32 units)
Questions for Institutions

arrow

Questions for Students
CRA COMMITTEE: STUDENT

Duncan Buell (South Carolina)
Tracy Camp (Mines)
Ed Lazowska (UW)
Leen-Kiat Soh (Nebraska)
Jodi Tims (Baldwin Wallace)

Jane Stout (CRA)
Lida Beninson/Jan Cuny (NSF)
Center for Evaluating the Research Pipeline
Fall 2015 Student Survey

N = 9721 took survey

N = 2563 students in intro to CS course
### Why did you enroll in an intro CS course?

**for students who are NOT CS major/minor**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Non-major/minor (N=405)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was required for my major/minor</td>
<td>64%</td>
</tr>
<tr>
<td>Curiosity/interest in computers</td>
<td>54%</td>
</tr>
<tr>
<td>A teacher/mentor encouraged me</td>
<td>13%</td>
</tr>
<tr>
<td>My parents encouraged me</td>
<td>6%</td>
</tr>
</tbody>
</table>
Why did you enroll in an intro CS course?  
*for students who are NOT CS major/minor*

<table>
<thead>
<tr>
<th>Reason</th>
<th>Non-major/ minor (N=405)</th>
<th>White/Asian Students (N=324)</th>
<th>URM Students (N=81)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was required for my major/minor</td>
<td>64%</td>
<td>62%</td>
<td>74%</td>
</tr>
<tr>
<td>Curiosity/interest in computers</td>
<td>54%</td>
<td>56%</td>
<td>43%</td>
</tr>
<tr>
<td>A teacher/mentor encouraged me</td>
<td>13%</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>My parents encouraged me</td>
<td>6%</td>
<td>7%</td>
<td>1%</td>
</tr>
</tbody>
</table>

significantly different, p <= 0.05
% URM in courses surveyed (2005-2015)

3x in raw numbers for URM

2014-15 Taulbee: 13%

(~32 units)
Data Analysis

PRELIMINARY!!
Questions for Institutions

Questions for Students
Are we in a boom or are we in a new era?

What should we call this enrollment surge?
CSinAll Era?  CSinAll Boom?

Centrality of Computing
CompUbiquity

Mobile  Big Data  ????

Please email me (Tracy Camp) OR Betsy Bizot
OR leave suggestion at CRA table.

Vote in post-Snowbird survey!
Plans
Goal: finish report by early Fall 2016
Committee on Growth of CS Undergraduate Enrollments
http://sites.nationalacademies.org/CSTB/CurrentProjects/CSTB_171607

Chairs:
Jared Leigh Cohon (CMU)
Susanne Hambrusch (Purdue)

Staff:
Emily Grumbling, CSTB
COMMITTEE MEMBERS

M. Brian Blake (Drexel)
Tracy Camp (Mines)
David Culler (UC Berkeley)
Susan Davidson (Penn)
Brian Fitzgerald (BHEF - workforce)
Ann Quiroz Gates (Texas-El Paso)
Charles Isbell (GATech)
Clas Jacobson (United Tech Corp - workforce)
Michael McPherson (Spencer Foundation - economics)
Eric Roberts (Stanford)
Valerie Taylor (Texas A&M)
Jodi Tims (Baldwin Wallace)
Sarah Turner (UVA - economics)
NA COMMITTEE REPORT

Four working groups:
- Workforce and Degree Trends
- Institutional Strategies
- Diversity
- Non-CS majors

Workshop: August 15, 2016

Goal: finish report by end of year
2016 SNOWBIRD

Booming Enrollments: Understanding the Surge

Impact on Department Practices (Ballroom 3)
  Susanne Hambrusch (Purdue)
  Stu Zweben (Ohio State)

Student Profiles/Motivations (Ballroom 2)
  Tracy Camp (Mines)
  Mary Hall (Utah)

Programs for High Achieving Students (Ballroom 1)
  Nancy Amato (Texas A&M)