Center for Inclusive Computing

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Level-Up, Washington DC
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Goals:

1. Share learnings from work with 23 universities on retention

2. Share learnings from work with 58 universities on intersectional data collection and analysis

3. Share Northeastern’s experience creating 43 interdisciplinary computing degrees (CS+X)
• 25% of all CS grads
• 17 HSIs
• 1 PBI
• All but 6 public
• 11 ranked in CS top 20
Learnings on Retention
1. Fix the institution, not the student.

2. The department has room to act.

3. Start with retention, then work on attraction.
We have found 10 systemic interventions that work: 6 focused on not losing the students who show up

1. Address distribution of prior experience
2. Centralize TA recruiting, training and evaluation
3. Sync sections
4. Create computing “in context” intro courses
5. Eliminate monster degrees and impossible semesters
6. Support students via advising and other co-curricular means
...and 4 focused on inviting more students to come

1. Create a CS0
2. Make CS0/CS1 satisfy general requirement
3. Don’t cap enrollments based on GPA in CS1/2, Calc 1, etc.
4. Create interdisciplinary computing majors
Learnings on Intersectional Data
• 58 universities currently participate in the CIC’s data program

• This demonstrates that universities *can* unlock demographic data held centrally (but incentives may be required)
V2 of CIC’s visualization and collection system is up and running and we are integrating short surveys created by CERP from Data Buddies.
Learnings from 43 “CS+X” majors at Northeastern
What is a combined major at Northeastern?

9-10 classes in Y  +  9-10 classes in X  +  1-2 integrative classes and a capstone
Example: BS in Computer Science and Design

- 6 core CS + 3 CS electives
- 5 core design + 2 design specialization courses + 3 design electives
- Human Computer Interaction + Psychology Course + Capstone
2001  Mathematics
2001  Physics
2001  Cognitive Psychology
2005  Biology
2006  Music Comp. and Tech.
2006  Business Admin.
2008  Media Arts
2009  Environmental Science
2010  Game Development
2011  Journalism
2014  Computer Engineering
2014  Communication Studies

During 2014-2021 we added 30 additional computing combined majors.
At Northeastern, combined majors drove the increase in representation of women in computing.

**2014**
404/811 majors are combined
Of combined, 21% are women (vs. 17% for within-discipline majors)

**2022**
2042/3528 majors are combined
Of combined, 40% are women (vs. 28% for within-discipline majors)

**2022 incoming 1st yrs**
349/557 majors are combined
Of combined, 53% are women (vs. 32% for within-discipline majors)
Intersectional Data

**Women**
- 2014: 19%
- 2022: 35%

**Men**
- 2014: 81%
- 2021: 65%
Yield Rates: 2018-2022

<table>
<thead>
<tr>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science only</td>
<td>Combined</td>
</tr>
<tr>
<td>Humanities only</td>
<td></td>
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</tbody>
</table>
CS + Design

- Graduate School
- Job
We looked at LinkedIn data for grads and observe no difference in jobs/salaries for computing-only versus combined:

- Many combined majors are hired at “pure” tech companies such as MS, Google, Amazon, etc.
- But, combined majors have the additional opportunity to work at the juncture of their two disciplines (e.g., biotech and fintech)
Before you invite students from other disciplines to combine with CS, ensure beginners are truly welcome.

1: All NU students take CS1 (in Racket) and CS2 (in Java).

In 2014, CS1 DFW rate in = 25%, not uniformly distributed by gender, race/ethnicity.

2: Create 2 sections of CS1 & CS2 ("accelerated" and "standard"). Improve TA training.

Students self-select based on prior experience and comfort level.

3: DFW rate decreased from 25% to <5%

Now uniformly distributed across populations.

We see no difference in performance in CS3.
Final Thoughts
Current Efforts:

1. Grant funding for 9 more schools, focused on retention
2. Grant funding for CS transfer pathways (community college + 4-year universities)
3. NSF Alliance DAPPIC (CIC + CRA CERP)
4. Expanding the MS Pathways Consortium (23 schools today)
5. NSF-funded “Bridge to Cyber” program for SFS CyberCorps Schools (7 schools)
6. Launching national demonstration project to implement multiple interdisciplinary computing degrees at 8 large public universities
Thank you!