BJC in Action: Comparison of Student Perceptions of a Computer Science Principles Course

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RESPECT 2015
BJC Course Description

- BJC uses the Snap visual programming language to introduce students to programming concepts
- BJC is centered on 7 Big Ideas:
  - Creativity, Abstraction, Algorithms, Programming, Big Data, the Internet and Social Impacts
- Students build computing artifacts to show impacts of computing (web pages, apps, games, etc.)
Motivation

~300,000 students in AP Calculus AB in 2014
  49% female; 24% minority students
<40,000 students in AP Computer Science in 2014
  20% female; 22% minority students

Initiatives to broaden participation in computing include development of Exploring Computer Science course and AP CS Principles (CSP).

The Beauty and Joy of Computing (BJC) is a CSP curriculum

How well does this curriculum meet the needs of students from underrepresented groups?
Research Question

For high school students in a BJC course, do females or minority students:

- Have different backgrounds coming in?
- Have different experiences during the course?
- Have different outcomes from the course?
Sample

- 399 post-course surveys from BJC students
- 19 classrooms where teachers had undergone BJC PD the previous summer

<table>
<thead>
<tr>
<th></th>
<th>Current Sample</th>
<th>AP CS 2014</th>
<th>US 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>45.1%</td>
<td>49.7%</td>
<td>75.1%</td>
</tr>
<tr>
<td>African American</td>
<td>9.5%</td>
<td>3.7%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Asian</td>
<td>12.8%</td>
<td>28.2%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>12.5%</td>
<td>8.3%</td>
<td>16.3%</td>
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<tr>
<td>American Indian</td>
<td>1.5%</td>
<td>&lt;0.01%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Multi-racial/Other/Not Stated</td>
<td>18.5%</td>
<td>10.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Total URM</td>
<td>32.1%</td>
<td>22.0%</td>
<td>–</td>
</tr>
<tr>
<td>Total non-URM</td>
<td>62.2%</td>
<td>77.9%</td>
<td>–</td>
</tr>
<tr>
<td>Male</td>
<td>72.9%</td>
<td>80.0%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Female</td>
<td>23.3%</td>
<td>20.0%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Respondents</td>
<td>n = 399</td>
<td>n = 39,278</td>
<td></td>
</tr>
</tbody>
</table>
Prior Experience

- Fewer minority students had access to a computer at home (87.5% vs 96.8%; $p=0.001$)
  - No difference in smartphone or tablet access
- More female students had access to a tablet at home (60.2% vs 44.7%; $p=0.013$)
  - Both findings significant when controlling for classroom
- Minority students had taken more CS courses ($p=0.006$); females had taken fewer ($p=0.003$)
  - Not significant when asking *whether or not* a student had taken a CS course
  - Not significant when controlling for classroom

Results
During the Course

- No significant difference in interest in specific BJC activities for either group:
  - Pair programming
  - Making mobile apps and games
  - Learning how CS has changed the world

- No significant difference in:
  - Willingness to recommend the course to a friend
  - Number of hours spent on BJC activities outside class
  - Perception of how well the class embraced diversity:
    - "The learning environment was free from discrimination."
    - "In this class, I felt out of place."
    - "In this class, I felt comfortable interacting with students with different characteristics."
After the Course

- Fewer minority students intended to take CS courses in the future (53.1% vs 69.4%; $p=0.002$)
  - Significant when controlling for classroom
  - No significant difference between males and females

- Fewer minority students intended to major/minor in CS (39.8% vs 53.2%; $p=0.019$)
  - Significant when controlling for classroom
  - Females were less likely (40.9% vs 52.6%; $p=0.082$)

- No significant difference in intention to major/minor in STEM fields generally
  - Females were less likely (43.0% vs 52.8%; $p=0.088$)
Takeaway

- High school students have diverse CS backgrounds
  - Females had taken fewer previous CS courses, while minority students had taken more
- Some effects are classroom-dependent
  - E.g. number of previous CS courses
- BJC was generally well received by diverse students
  - Emphasis on a relevant and engaging curriculum
- No gender effect on students' interest in CS topics?
- Still much work to be done
  - Minority students less likely to pursue CS in the future
  - This is not the case for STEM as a whole
Thank You!

Questions?