Gaining Insights Into The Effects Of Culturally Responsive Curriculum On Historically Underrepresented Students' Desire For Computer Science

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June 2016

Equalizing Participation in Computer Science

1. A lack of presence of CS in K-12 education.
2. **The under-production of post-secondary degrees in CS**.
3. **The underrepresentation of women in CS**.
4. The underrepresentation of ethnic minorities in CS.
5. A lack of positive CS role models in the media.

Three pathways into CS at UC Berkeley

- **CS3: Introduction to Symbolic Programming** .
- CS61A: Structure and Interpretation of Computer Programs.
- CS61AS: Self paced version of CS61A

In her study of attrition in undergraduate CS at Berkeley, Lewis found that female students were disproportionately weeded out of the track, often starting at CS3 (Lewis 2010).

The Beauty and Joy of Computing

- Uses mixture of Snap! blocks based language and python.
- Re-frames CS as a tool that should be in service of society.
- CS + X approach, i.e., CS + X for all X.
- Prioritizes the need for students to decide their own projects.

Three pathways into CS at UC Berkeley

- **CS10: The Beauty and Joy of Computing** .
- CS61A: Structure and Interpretation of Computer Programs.
- CS61AS: Self paced version of CS61A.

Data Collection

Survey Participant Break Down

Class	Female	Male
CS10 Fall 2014	144	116
CS10 Spring 2015	73	54
CS61A	171	324
Total	388	494

Dimensions Developed to Measure Participant's CS Interest

Code	Dimension
atcs	Attitudes about CS competency.
atcsgender	Attitudes about the role of gender in CS
atct	Understanding of computational thinking
blg	Sense of belonging in the CS classroom.
clet	Attitudes about social implications and ethics.
cltrcmp	Understanding around cultural competency.
mtr	Access to CS Mentors.
prcs	Pre-Collegiate CS awareness.

Table 0.1: Survey Instrument Dimensions to Measure CS Interest

Belonging

- Students generally had a stronger, statistically significant experience of belonging in CS10 as compared to CS61A.
- Important to notice that only around 50% of female learners had a positive sense of belonging ($p = 0.00104$) .

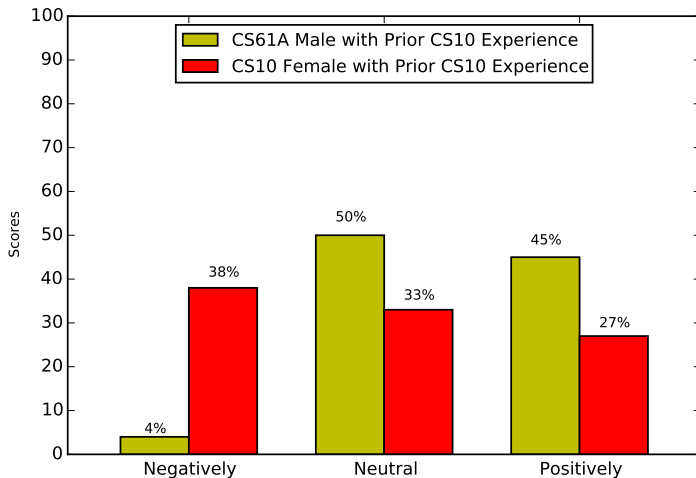# Effect of CS10 on CS61A Experience: Belonging

- Students who had already taken CS10 seems to have a lower sense of belonging in CS61A, and in particular, female students, this effect seems magnified.

Effect of CS10 on CS61A Experience: Belonging

In this class I feel like I belong.
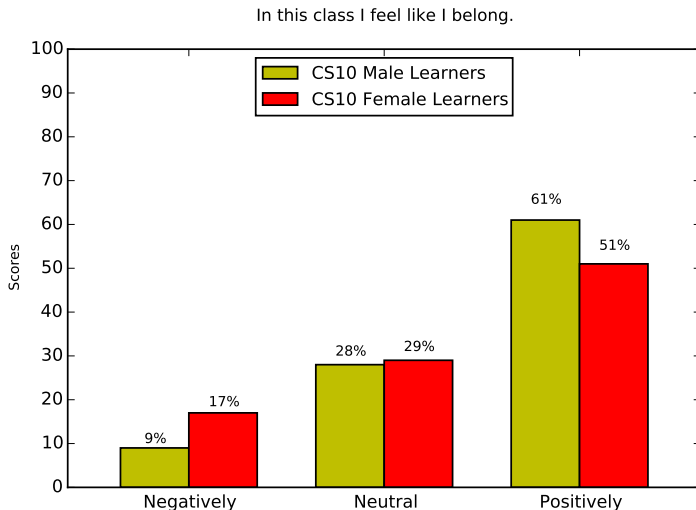
Effect of CS10 on CS61A Experience: Belonging

In this class I feel like I belong.

What impact does CS10 have in attracting female students into the major?

BLG_1: In this class, I feel I belong.

BLG_3: In this class, I feel like my ideas count.

BLG_4: In this class, I feel like I matter.

ATCS_3: I can achieve good grades (C or better) in computing courses.

ATCS_8: I am confident about my abilities with regards to CS.

ATCT_4 : I am persistent at solving puzzles or logic problems.

ATCT_5 : I know how to write computer programs.

ATCT_6 : I am good at building things.

ATCT_8: I know how to write a computer program to solve a problem.

What impact does CS10 have in attracting female students
into the major?

- The relationship between these two variables seem to increase
  as girls move forward in the pipeline, as can be seen from the
  figures, we are led to conclude that this relationship is truly a
  strong predictor of CS belonging.
- - **blg_1**
  - **atct_5**
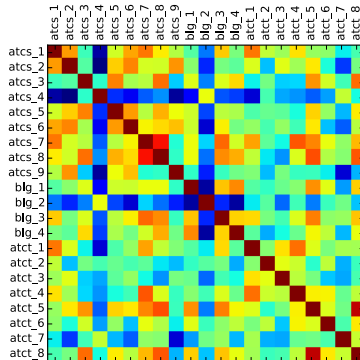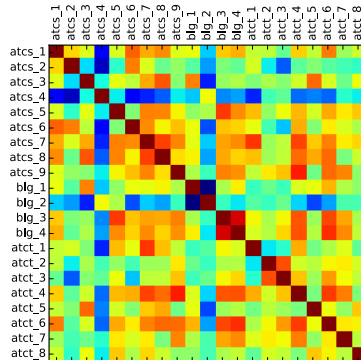
(a) Female   (b) Male

Figure: **Correlation matrix of CS61A students who had previously taken CS10** *For female students **blg_1** & **atct_5** are correlated. While for males we observe that it is **atct_4** & **blg_3**, and **blg_4** & **atct_6**.*
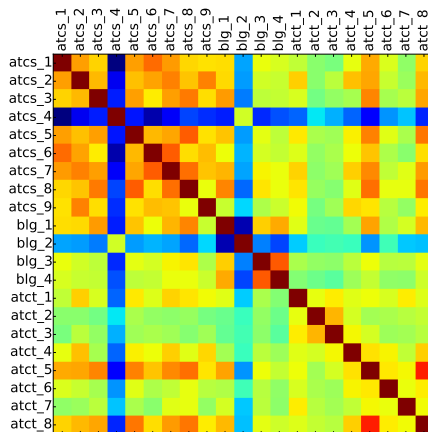
Figure: **Correlation matrix for female students in CS61A at UC Berkeley** *There is a correlation between blg_1 and atct_5, for female students in this class.*

Conclusion

- CS10 has a statistically positive effect on female students belief about CS achievement.
- While CS10 is successfully serving as a gateway into the major for underrepresented students, from the analysis, as great a class as CS10 is, there are still some significant environmental challenges that the overwhelmingly male environment of CS61A poses to female students sense of belonging when they advance on to 61A.

Conclusion

Thank you for your attention!
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