EXPLORING CLASS AND GENDER IN SUPPORTING STEM STUDENTS

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THE PROBLEM:
LACK OF DIVERSITY IN STEM FIELDS

- Women are underrepresented in certain STEM fields (NSF, 2014)
  - Less than 20% of physics, computer science, & engineering bachelor’s degrees
  - But just over half of bioscience & social science bachelor’s degrees

- Retention rates are lower for first-generation & low-income students than continuing-generation and higher-income counterparts (NCES, 2014)
  - About 30% of first-gen students and low-income students who begin a bachelor’s degree as a STEM major leave without the degree
  - Dropout rate is almost double of continuing-gen students and high-income students
WHY IS THAT A PROBLEM?

• **STEM degrees are high earning**
  • About half of the gender pay gap can be accounted for by major/degree/job (AAUW, 2015)
  • 42% of first-generation college students have student loan debt totaling more than $25,000

• The talent pool for STEM fields is greatly reduced

• Science requires innovation, and diversity aids innovation
  • Diverse groups are more creative & make better decisions (Bantel & Jackson, 1989; Hong & Page, 2004)
The culture of science more closely matches the culture of (white) middle-class & wealthy men than other groups.

*Important Note:* There is wide variability within groups, so while it is helpful to be aware of group-level differences, it is counterproductive to overgeneralize these differences to individual group members.
CAN WE SHIFT THE CULTURE OF SCIENCE TO BECOME MORE INCLUSIVE?

Current State of STEM

- Science Culture
- Masculine Culture
- Feminine Culture

Hopeful Future of STEM

- Science Culture
- Masculine Culture
- Feminine Culture
PERCEIVED QUALITIES OF A SUCCESSFUL SCIENTIST

Ramsey, 2017

Open-Ended Responses

- agentic: 37%
- communal: 24%
- neither: 39%

More agentic than communal, $t(167) = 5.13, p < .001$

Ratings of Importance (open- & closed-ended ratings)

- Faculty: Main Effect of Trait Type, $F(1, 201) = 74.77, p < .001$; Interaction, $F(1, 201) = 5.26, p = .02$
ARE COMMUNAL GOALS COMPATIBLE WITH STEM?

Diekman, Clark, Johnston, Brown, & Steinberg, 2011

Figure 1. Effects of participant sex on goal endorsement (Study 1a). Ratings of goal endorsements were made on a scale ranging from 1 (not at all important) to 7 (very important).

Figure 2. Goal affordance stereotypes by career (Study 1b). Ratings of the likelihood of goal fulfillment were made on scales ranging from 1 (not at all) to 7 (extremely).
Figure 5. Goal affordances mediate the framing effect on career attitudes (Study 3). Framing was dummy-coded as 0 = independent, 1 = collaborative. Standardized regression coefficients are given in parentheses. ***$p \leq .001$. 

Female Participants:

- Perceived Communal Affordances
  - 2.28 (.59)***
- Positivity Toward Career
  - 0.47 (.62)***

Framing

Unmediated: 1.01 (.34)***
Mediated: −0.07 (−.02)
ANOTHER EXAMPLE: ENVIRONMENTAL CUES

Cheryan, Plaut, Davies, & Steele, 2009
ANOTHER EXAMPLE: ENVIRONMENTAL CUES

Murphy, Steele, & Gross, 2007
A CYCLICAL PROBLEM: LACK OF PEERS & ROLE MODELS

Blake-Beard, Bayne, Crosby, & Muller, 2011

- Survey of over 1,000 students/postdocs in STEM on MentorNet
- Women (compared to men), racial minorities (compared to Whites), and undergraduates (compared to grads/postdocs) are more likely to report wanting a mentor that matches them on race & gender and “understands their background”
- Gender & race matches were perceived as more helpful, though there were no differences in GPA or scientific efficacy
A CYCLICAL PROBLEM: LACK OF PEERS & ROLE MODELS

Wow, you suck at math.

WOW, GIRLS SUCK AT MATH.
HOW DO WE IDENTIFY SOCIAL CLASS?

- Indicators?
- Class is socially constructed
- Boundaries and meanings of class categories
  - Shift and change
  - Created and recreated every day through social interaction
- Even when using objective measures ...
  - social class identity can “hide,” or be invisible
  - My class story
IDENTIFICATIONS

- First Gen and Working Class
  - Overlap, but not the same
  - Low-Income often considered part of WC
- Students may not self-identify as FG/WC
  - Reluctance
  - Awareness
- Labels carry personal, social, and institutional consequences
  - Particularly at elite schools
  - Warnock and Hurst (2016)
WORKING-CLASS IDENTITY AS LACK

- The WC student’s difference, implicitly constituted as lack, is what college is designed to erase (Warnock 2014, Casey, 2005)
- Social class inequalities are often ignored in campus diversity frameworks (Michaels 2007).

- FG/WC Student Assets
  - Tenacity, creativity, moral purpose, and unique cultural dispositions (Lehmann 2009; Yosso 2005).
  - ...for many, just having gotten to campus demonstrates these qualities
  - Their presence enlivens the academic pursuits around them, contributing to the diversity of campus life (Casey 2005).
  - Yosso (2005) argues that students of color, many of whom are WCFG students, bring forms of capital including knowledge and skills
“Class identities do matter, particularly in social contexts, like university, in which the invisibility of class actually highlights its relevance.”
- Lehmann (2009)

“When individuals are socialized within a working-class family environment, they can expect to experience ‘culture shock’ when they achieve upward mobility that takes them out of their class of origin and into the foreign terrain of middle-class culture.”
- Morris and Grimes (2005)

Class Cultural mismatch
- Sometimes summarized as focus on independence versus interdependence
Fig. 1. Cortisol levels (% increase from baseline) by student status and condition.
Moving between these social class cultural worlds can be costly. Many successful working-class students report “changing and usually conflicting relationships with parents and former friends” (Lehmann 2013).

Hurst (2010) finds that successful WC students adopt 1 of 3 strategic roles:

- **Loyalists**
  - maintain commitment to their working-class cultural roots,
- **Renegades**
  - embrace middle-class culture and goals, and
- **Double agents**
  - work to maintain a foothold in each world.

Key factor in success may be development of social and cultural capitals that are effective on campus.
SOCIAL CAPITAL

- Who you know
  - The “connections among individuals - social networks and the norms of reciprocity and trustworthiness that arise from them.” (Putnam, 2001)

- Questions:
  - Did many of a student’s friends in HS go to college?
  - Are many of a student’s campus friends commuter or residential students?
CULTURAL CAPITAL

• **What you know**
  - Any non-monetary asset in social life (Boudieu, 1986)
  - The “strategic use of knowledge, skills, and competence” deployed when individuals come into contact with institutions and institutional actors (Lareau and Weininger, 2003, p. 597)

• **Questions:**
  - Did the student always want to go to college?
  - Does the student meet with professors?
  - Would the student be comfortable with family meeting their professors?
OSU Registrar created a random sample of 3000 first and second-year OSU students (including transfer students in their first year), excluding students participating in TRIO or EOP programs.

Separately, ALL first and second year EOP and TRIO students were sent the survey.

The survey was open from April 27th to May 8th.

A total of 3,344 students were invited to take the survey.
  • 793 surveys were initiated (24% response rate).
  • 709 responses were completed (78% completion rate).
Educational Levels of Parents/Caregivers

More than half of parent’s have at least a college degree…about a quarter of each parent has an advanced degree of some kind!
Ancestral Education by Class of Student

- first-gen college student
- second-gen college student
- third-gen college student

working class:
- Working class: 40%
- Middle class: 20%
- Upper class: 20%

middle class:
- Working class: 20%
- Middle class: 40%
- Upper class: 40%

upper class:
- Working class: 0%
- Middle class: 20%
- Upper class: 80%
1GWC students have a higher proportion of female students.
(1) 1GWC have lower proportion of White students; 
(2) Racial minorities not distributed evenly across class categories
GWC students are underrepresented in Engineering, Business, Ag & Wildlife, and the Humanities, while they are greatly overrepresented in STEM and mildly overrepresented in Health & Nutrition and Social science.

Business skews towards the upper class, as do the Arts.

Middle students are overrepresented in engineering.
VARIATIONS WITHIN MAJOR CLUSTER

- Even within major clusters, class distinguishes particular major choices

- STEM:
  - 3GUC more likely to major in engineering fields (particularly electrical and mechanical), while 1GWC more likely to major in biology and math and civil/construction engineering

![Bar chart showing WC/UC ratio for different majors]
HELPING NETWORK STRATEGIES: MORE 1GWC HAVE LOW NETWORKS AND RELY ON INSTITUTIONAL ASSISTANCE MORE OFTEN THAN OTHER GROUPS

- **Low**
- **High Family & Friends**
- **High Others**
- **High Institution**
- **Multiple High**

### 1GWC
- Low: 0.4
- High Family & Friends: 0.09
- High Others: 0.05
- High Institution: 0.14
- Multiple High: 0.33

*Many 1GWC students have lower than average help networks of any kind*

### MIDDLE
- Low: 0.4
- High Family & Friends: 0.18
- High Others: 0.05
- High Institution: 0.1
- Multiple High: 0.39

### 3GUC
- Low: 0.25
- High Family & Friends: 0.25
- High Others: 0.02
- High Institution: 0.04
- Multiple High: 0.43

*More 3GUC use family and friends for help*
SUPPORTING WC AND FG STUDENTS

- We create and re-create culture on campus every day
- Validation
  - Rendon (1994)
- Sense of belonging
  - Strayhorn (2012)
- Development of social and cultural capitals
  - King, Griffith, and Murphy (2017)
THE CLASSROOM

- Primary location where students interact with faculty and peers
QUESTIONS TO CONSIDER

How does your work influence students’ perceptions of the culture of science?
- Teaching, mentoring, advising, committee work
- Explicit & implicit messages about who “fits” with STEM

Are there subtle changes that you could make at your university that would create a more inclusive environment?