Transforming the Social Ecology of College Classrooms with a Social-Psychological Intervention

KEVIN BINNING
UNIVERSITY OF PITTSBURGH
Research Team

- Chandralekha Singh (Physics)
- Danny Doucette (Physics)
- Emily Marshman (Physics)
- Yasemin Kalender (Physics)
- Omid Fotuhi (LRDC)

- Nancy Kaufman (Biology)
- Erica McGreevy (Biology)
- Susie Chen (Psychology)
- Lisa Limeri (Biology)
- Laura Betancur (Psychology)

Special thanks to Greg Walton
Understanding the creation of achievement gaps

- Prior versus Emergent Achievement Gaps
  - More than just prior differences.
  - Gaps emerge in the context of college itself.
Emergent Gaps Model

E.g., Uniform college admissions process, statistical adjustments to SAT, high school GPA
Emergent gaps model
Emergent gaps model
## Historical grade data (4-point scale)

<table>
<thead>
<tr>
<th></th>
<th>Physics (N = 3095)</th>
<th>Biology (N = 4393)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-0.23 (.17)</td>
<td>0.30 (.14)**</td>
</tr>
<tr>
<td>SAT Math</td>
<td>0.42 (.03)**</td>
<td>0.14 (.02)**</td>
</tr>
<tr>
<td>SAT Verbal</td>
<td>-0.04 (.03)</td>
<td>0.08 (.02)**</td>
</tr>
<tr>
<td>High School GPA</td>
<td>0.61 (.04)**</td>
<td>0.24 (.04)**</td>
</tr>
<tr>
<td>Year 1 dummy</td>
<td>-0.09 (.04)*</td>
<td>-0.32 (.04)**</td>
</tr>
<tr>
<td>Year 2 dummy</td>
<td>-0.09 (.04)*</td>
<td>0.00 (.04)</td>
</tr>
</tbody>
</table>
## Historical grade data (4-point scale)

<table>
<thead>
<tr>
<th></th>
<th>Physics (N = 3095)</th>
<th>Biology (N = 4393)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-0.23 (.17)</td>
<td>0.30 (.14)**</td>
</tr>
<tr>
<td>SAT Math</td>
<td>0.42 (.03)**</td>
<td>0.14 (.02)**</td>
</tr>
<tr>
<td>SAT Verbal</td>
<td>-0.04 (.03)</td>
<td>0.08 (.02)**</td>
</tr>
<tr>
<td>High School GPA</td>
<td>0.61 (.04)**</td>
<td>0.24 (.04)**</td>
</tr>
<tr>
<td>Year 1 dummy</td>
<td>-0.09 (.04)*</td>
<td>-0.32 (.04)**</td>
</tr>
<tr>
<td>Year 2 dummy</td>
<td>-0.09 (.04)*</td>
<td>0.00 (.04)</td>
</tr>
<tr>
<td>Asian</td>
<td>-0.02 (.05)</td>
<td>-0.13 (.04)**</td>
</tr>
<tr>
<td>Black</td>
<td>-0.22 (.07)**</td>
<td>-0.09 (.06)</td>
</tr>
<tr>
<td>Latin</td>
<td>-0.17 (.10)</td>
<td>-0.04 (.09)</td>
</tr>
<tr>
<td>Female</td>
<td>-0.13 (.04)**</td>
<td>-0.01 (.04)</td>
</tr>
</tbody>
</table>
Where do the gaps come from?

- H1. They are social psychological in origin
  - Experiences in the classroom can communicate lack of belonging
  - Stereotypes are “in the air”
  - “Maybe people like me do not belong here”
  - “Maybe people like you do not belong here”
Prior research

- Walton & Cohen (2007; 2011) and Yeager et al. (2016)
  - Targeted individuals with the message that adversity is universal (everyone struggles sometimes) and temporary (things get better if you stick with it)
  - Benefits on grades, retention, graduation for stigmatized groups
  - Targeted the “me” – the individual
Present Approach

Targeted students’ perceptions of themselves and others

- Students get the message, and they know their classmates have gotten the message, too
  - “I know that you know that I know that you know….  

Establish a new classroom norm

- Teach students that adversity is UNIVERSAL and TEMPORARY
Classroom-level random assignment

Experimental classrooms undergo intervention

Control classrooms do business as usual

Introduction: “It can be easy to feel overwhelmed or to sometimes wonder to yourself ‘do I really belong here?’”
Hi, my name is ___________. I am a graduate student working in physics department. Today we are going to take a break from the regular classroom activities to talk about {Transition}. We are always trying to make things better for our students, and so today the Physics Department is asking for your help to tell us a little about your experiences since you have come to Pitt. For many of you, this is the first time you are leaving home, you are meeting a lot of new people, taking on a lot of new courses, and trying to find your place here at Pitt. It can be easy to feel overwhelmed and to ask yourself, “Do I really belong here?” and “Am I smart enough to make it?”
Students in Recitation Sections.

Experimental classrooms undergo intervention

Control classrooms do business as usual

Introduction: “It can be easy to feel overwhelmed or to sometimes wonder to yourself ‘do I really belong here?’”

Independent reflective writing activity.
“Today, we’d like each of you to reflect on some of the experiences you have had so far in coming to college. So, please take about ten minutes to write on the sheet of paper I passed out to you about the experiences and challenges you have had since coming to Pitt. What has been difficult or challenging for you? You can think about your experiences meeting other students, making friends, taking classes, adjusting to dorm life: look, coming to college is a big transition. Please write about some of the difficulties you have experienced in the transition to college and, as well, how some of these difficulties and challenges have begun to improve with time as you have spent more time in college.”
Students in Recitation Sections.

Experimental classrooms undergo intervention

Control classrooms do business as usual

Introduction: “It can be easy to feel overwhelmed or to sometimes wonder to yourself ‘do I really belong here?’”

Independent reflective writing activity.

Students receive quotes from graduating seniors designed to highlight overcoming challenges and adversity.
“As I’m looking few some examples of what you all have written, I see a lot of very common concerns that you have. I am also not surprised that I had some of the same concerns when I took freshmen physics (after briefly skimming a handful of essays)....
Example quotes

I was one of just a handful of women in one of my intro physics study groups, and sometimes I felt a little embarrassed to ask questions. However, I quickly learned that other students usually had the same question I did, and we all benefitted from working with each other and learning from each other. Sometimes I had difficulty with an idea that my classmates understood. Other times, they struggled with concepts that I understood. I remember there wasn’t always an “aha!” moment, where everything clicked. It was usually much more gradual, with some concepts only becoming clear after lots of practice and discussion with my study group. I realized that everyone struggles some times, and the important thing is to not give up and help each other out.”

-Allison, Pitt Electrical Engineering Senior
Example quotes

“Before coming to college, I didn’t worry much about grades, so I felt unprepared for the increased workload and differences in grading. I remember being surprised after getting burned grade-wise several times, and feeling stressed as a result. But then I got some help from the instructor and the TA, found a study group, and was able to turn things around. Looking back now, I think my struggles were pretty normal. Even though people don’t like to admit it, basically everyone has trouble with certain concepts. Although it was a somewhat rocky start, it felt good to learn from my mistakes, and I am proud of the success I have had.”

-Nathan, Pitt Bioengineering Senior
Students in Recitation Sections.

Experimental classrooms undergo intervention.

Control classrooms do business as usual.

Introduction: “It can be easy to feel overwhelmed or to sometimes wonder to yourself ‘do I really belong here?’”

Independent reflective writing activity.

Students listen to quotes from graduating seniors designed to highlight overcoming challenges and initial loneliness.

Discuss essay and quotes with teammates.
Discussion prompts

- Why do you think people often think they’re the only one who worries about whether they fit in in college?
- How do you think your life will be different when you are a junior or senior?
Students in Recitation Sections.

Experimental classrooms undergo intervention

Control classrooms do business as usual

Introduction: “It can be easy to feel overwhelmed or to sometimes wonder to yourself ‘do I really belong here?’”

Independent reflective writing activity.

Students listen to quotes from graduating seniors designed to highlight overcoming challenges and initial loneliness.

Discuss essay and quotes with teammates.

Recitation-wide discussion and sharing by undergraduate teaching assistants and students
“All right, let’s come back together. I’ve been overhearing some great discussions and I’d love to hear your thoughts. I think your feedback is going to be very helpful for the physics department.”
Results

Average course grade

Control
Social Belonging

Women
Men
Biology intervention (N = 1215)

- Similar design – 8 recitation sections received intervention, 8 completed business-as-usual
Intervention in Biology

Average course grade (4pt. scale)

Control
Social belonging

Non-White
White
Biology grade: No gender effects

![Average Course Grade (4pt. scale)](image)

- Control
  - Men: 2.4
  - Women: 2.3

- Social Belonging
  - Men: 2.6
  - Women: 2.5
Evidence of ecological effects?

- Cumulative GPA
  - 2 years later for Physics
  - 2.5-4 years later for Biology
- Possible for recursive processes to unfold (Cohen & Sherman, 2016)
Examining Attendance as a Moderator

- If class is a place where norms and mindsets can be taught, attendance in such classes should be beneficial
  - Like a dosage variable
Attendance on cumulative GPA 2 years later (Physics Students: N = 590)

- Conditional effect of **Attendance** on **GPA** in each condition:
  - **Condition** | **Effect** | **p**
  - Control:      | .12       | <.0001
  - Belonging:    | .47       | <.0001
Controlling for Course Grade

- Let’s control for course grade.
  - Control the “good student” part of cumulative GPA, capturing just attendance.
## Attendance on cumulative GPA 2 years later
(Physics Students: N = 590)

- Conditional effect of **Attendance** on **GPA** in each condition:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Effect</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>.12</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Belonging</td>
<td>.47</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Attendance on cumulative GPA 2 years later
(Physics Students: N = 590)

- Conditional effect of Attendance on GPA in each condition:
  - Condition | Effect | p
  - Control:  | -.03   | .4161
  - Belonging:| .34    | .0005

CONTROLLING FOR COURSE GRADE
Attendance on cumulative GPA 2 years later
(Biology Students: N = 1190)
Attendance on cumulative GPA 2 years later  
(Biology Students: N = 1190)

- Conditional effect of Attendance on GPA in each condition:
  - Condition     Effect  p
  - Control       .16     <.0001
  - Belonging     .22     <.0001
Attendance on cumulative GPA 2 years later (Biology Students: N = 1190)

- Conditional effect of Attendance on GPA in each condition:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Effect</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control:</td>
<td>.01</td>
<td>.453</td>
</tr>
<tr>
<td>Belonging:</td>
<td>.06</td>
<td>.013</td>
</tr>
</tbody>
</table>

CONTROLLING FOR COURSE GRADE
Discussion

- Short-term closing of performance gaps
- Long-term benefits:
  - Regardless of student demographics, the intervention had long-term effects on students GPA, with greater benefits to those who had higher attendance in discussion section
  - Attendance was not predictive of GPA in the control condition (once course grades were taken into account).
Take Home Message

- We can engineer our classroom cultures to foster equity in the classroom and unlock student potential
Pitt Outreach Efforts

- Provost’s Research-Practitioner Advisory Board – Julia Spears & Kevin Binning
- Honors college first-year students (N ~ 350) – Kevin Binning & David Hornyak
- Introductory Biology students (N ~ 300) – Erica McGreevy + TA
- Basic Physics for Engineers (N ~ 750) – Workshop for TAs
- Health and Rehab Science Majors (N ~ 90) – Amy Evans
- Total N ~ 1,490
- Pitt Transition Study ~ 1,050 + 1,490 ~ 2,540
- Non-Pitt Outreach at New Mexico State University (19 treatment and 17 control sections of Introductory Biology)
- Planned: Indiana University, Chemistry and Biology Courses
Research Team

- Chandralekha Singh (Physics)
- Danny Doucette (Physics)
- Emily Marshman (Physics)
- Yasemin Kalender (Physics)
- Omid Fotuhi (LRDC)
- Nancy Kaufman (Biology)
- Erica McGreevy (Biology)
- Susie Chen (Psychology)
- Lisa Limeri (Biology)
- Laura Betancur (Psychology)

Special thanks to Greg Walton
Thank you