Project to Assess Climate in Engineering (PACE)

Selected Results from UW-Madison
PACE Study

Motivation

“The goal is to identify and address university climate issues to improve retention for all undergraduate engineering students”

- Special emphasis on women and under-represented minority students
- Provides benchmarking with other “peer” universities
PACE Study

- PI is Suzanne Brainard at the University of Washington
- 24 Engineering schools participated
  - University of Wisconsin-Madison and University of Washington participated on a pilot basis—student survey only
- Funded by Alfred P. Sloan Foundation and The Engineering Information Foundation
PACE Survey Content

- **Academic experiences**
  - Satisfaction with teaching
  - Satisfaction with professors
  - Satisfaction with TAs
  - Satisfaction with resources
- **Interpersonal experiences**
  - Interactions among students
  - Participation in student organizations
  - Experiences based solely on gender or race/ethnicity
- **Intrapersonal experiences**
  - Confidence
  - Career goals
- **Perceptions of Engineering**
- **Experiences of Transfer Students**
Response Rates

- Overall response rate: 36.3%
  - Women over-represented
  - Most non-white racial/ethnic groups under-represented
  - Freshmen over-represented/Seniors and super-seniors over-represented
- N=1,082
<table>
<thead>
<tr>
<th>Table 1. Characteristics of PACE Sample, UW-Madison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
</tr>
<tr>
<td>African American/Black</td>
</tr>
<tr>
<td>American Indian/Alaska</td>
</tr>
<tr>
<td>Native/Native</td>
</tr>
<tr>
<td>Hawaiian/Pacific Islander</td>
</tr>
<tr>
<td>Asian American/Asian</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
</tr>
<tr>
<td>White/Caucasian</td>
</tr>
<tr>
<td>Other/Unknown</td>
</tr>
<tr>
<td>International Student</td>
</tr>
<tr>
<td><strong>Targeted Minority</strong></td>
</tr>
<tr>
<td><strong>Rank</strong></td>
</tr>
<tr>
<td>Freshman</td>
</tr>
<tr>
<td>Sophomore</td>
</tr>
<tr>
<td>Junior</td>
</tr>
<tr>
<td>Senior+</td>
</tr>
<tr>
<td><strong>Mean GPA</strong></td>
</tr>
<tr>
<td>High GPA*</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Transfer Student</strong></td>
</tr>
<tr>
<td><strong>Student Works</strong></td>
</tr>
<tr>
<td><strong>Financial Need</strong></td>
</tr>
<tr>
<td><strong>CoE Student Organization</strong></td>
</tr>
</tbody>
</table>

* A High GPA is defined as 3.5 or higher.
Analysis

- **Analysis variables:**
  - Gender, Race/Ethnicity, Class Year, GPA, Transfer Status, Financial Need/Student Works, CoE Student Organization Membership

- **Within-CoE comparisons**
  - T-tests, differences between means
  - \( p < 0.05 \) for significance
  - Open-ended responses to highlight significant findings

- **CoE vs. peer institutions**
  - Purdue University, University of Michigan, Pennsylvania State University
  - Response rates are 35%, 33%, and 23%
  - Only means reported. Differences between peers and UW-Madison are considered “significant” if a ±0.2 difference in means was reported for at least two of the schools (in the same direction)
Ten Major Findings
Finding #1

- Students participating in student organizations have consistently high satisfaction with their CoE experiences
Satisfaction of CoE Student Organization Participants: Selected PACE Items

<table>
<thead>
<tr>
<th>Statement</th>
<th>CoE Org</th>
<th>No CoE Org</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no desire to declare a non-engr major</td>
<td><img src="chart.png" alt="Bar Chart" /></td>
<td><img src="chart.png" alt="Bar Chart" /></td>
</tr>
<tr>
<td>I intend to complete my engr degree</td>
<td><img src="chart.png" alt="Bar Chart" /></td>
<td><img src="chart.png" alt="Bar Chart" /></td>
</tr>
<tr>
<td>I am confident in my ability to succeed in engr courses</td>
<td><img src="chart.png" alt="Bar Chart" /></td>
<td><img src="chart.png" alt="Bar Chart" /></td>
</tr>
<tr>
<td>I am comfortable meeting with profs for help</td>
<td><img src="chart.png" alt="Bar Chart" /></td>
<td><img src="chart.png" alt="Bar Chart" /></td>
</tr>
<tr>
<td>I feel like I am part of an engr community</td>
<td><img src="chart.png" alt="Bar Chart" /></td>
<td><img src="chart.png" alt="Bar Chart" /></td>
</tr>
</tbody>
</table>

* Significant difference $p<.05$. 
Satisfaction of Women Students in the CoE: Selected PACE Items

* Significant difference $p<.05$. 

- I have no desire to declare a non-engr major
- I intend to complete my engr degree
- I am confident in my ability to succeed in engr courses
- I am comfortable meeting with profs for help
- I feel like I am part of an engr community
Finding #2

- Math courses are singled out as especially poor
Quality of Teaching

* CoE significantly different from Big-10 peers (see text)
Finding #3

- A culture of not asking professors for help is evident in data
In the graph, Student Contact with Professors is measured on a scale of 1 (Never) to 5 (All the time). The categories include Comfortable Meeting, Profs Keep Office Hours, Profs Encourage Office Hours, and Meet with Profs.

- **CoE** is represented by blue bars, and **Big 10 (Avg.)** is represented by yellow bars.

* CoE significantly different from Big-10 (see text)
“Each professor is different but on the whole, in class they want to help and answer questions. Outside the lecture, I am less comfortable asking them anything as they seem to be busy with research and won’t have time for me. If I do have a question outside of lecture, I will more than likely go to my TA and only if my TA suggests it will I go to my professor.”

(RID=351)
Finding #4

- TAs are given high marks by students
Student Contact with TAs

CoE significantly different from Big-10 peers (see text)
Finding #5

- CoE study centers and job placement help are very highly rated, relative to Big-10 peers
CoE Resources

Mean Response
(1=Not at all; 5=Extremely)

Study Centers  Advisors  Job Placement

CoE  3 Peers (Avg)

* CoE significantly different from Big-10 peers (see text)
(Non-)Finding #6

- Women students in CoE do not feel marginalized in lab groups
  - Asian students do, however
How often is lab work divided equally among lab group?

* CoE significantly different from Big-10 peers (see text)
Asian students (all ethnicities) have consistently lower satisfaction with their CoE experiences
Satisfaction of Asian Students in the CoE: Selected PACE Items

<table>
<thead>
<tr>
<th>Mean Agreement Score</th>
<th>Asian</th>
<th>Not Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no desire to declare a non-engr major</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>I intend to complete my engr degree</td>
<td>4.5</td>
<td>4.2</td>
</tr>
<tr>
<td>I am confident in my ability to succeed in engr courses</td>
<td>4.3</td>
<td>4.0</td>
</tr>
<tr>
<td>I am comfortable meeting with profs for help</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>I feel like I am part of an engr community</td>
<td>3.7</td>
<td>3.4</td>
</tr>
</tbody>
</table>

* Significant difference $p<.05$; # marginal significance $p<.10$. 
Singled Out Due To Race/Ethnicity
Asian students only

Percent Responding "YES"

* CoE significantly different from Big-10 peers (see text)
Finding #8

Women CoE students report very high levels of experiencing differential treatment based on gender compared to women in Big-10 peer schools.
Singled Out Due To Gender
Women respondents only

* CoE significantly different from Big-10 peers (see text)

NOTE: SH=sexually harassed
Finding #8:

Even the men notice:

“I think it’s very commonplace for Engineering students to joke about women, and how few of them there are in Engineering. The jokes seem harmless to us (men), but I’m sure their [sic] not to those few women actually in the field.” (RID=243)
Singled Out Unfairly Due To Gender
Women respondents only

* Significant difference $p<.05$
Faculty Express Stereotypes About Men and Women respondents only

* Significant difference $p<.05$
Sexually Harassed by a Faculty Member
Women respondents only

Percent Responding "YES"

0% 10% 20% 30% 40% 50% 60%

All Women No Engr Org Any Engr Org Honors Societies Projects Associations

* Significant difference $p<.05$
Sexually Harassed by a Student
Women respondents only

Percent Responding "YES"

- All Women
- No Engr Org
- Any Engr Org
- Honors
- Societies
- Projects
- Associations

* Significant difference $p<.05$
Finding #9

- Women CoE undergraduates have a “confidence gap”
Confidence in Abilities

* CoE women significantly different from CoE men ($p<.05$)
Do your professors think you have a lower ability than you actually have?

# CoE women significantly different from Big-10 women (see text)
Confidence in Abilities

* Significant difference between selected group and all others ($p<.05$)

NOTE: See Appendix 1 for actual question wording and response categories.
Finding #10

- UW-Madison Engineering students have a very positive view of Engineering as a discipline
- Very few gender differences, but many racial/ethnic differences
Perceptions of Engineering

Mean Response (1=Strongly disagree, 5=Strongly agree)

- Well-Paid
- Leave and Return
- Children
- Society Values
- Design Own Schedule
- Supports W/L Balance
- Boring
- Respected
- World Better
- Rewarding
- Easy Find Job
- Prepared for Job

* Significant difference between selected group and all others (p<.05)
Perceptions of Engineering

(1=Strongly disagree; 5=Strongly agree)

|---------------|-----------|----------------|----------|----------------|---------------------|---------------------|--------|-----------|--------------|-----------|--------------|------------------|

* Significant difference between selected group and all others (p<.05)