Micromessages: Recognizing Nuance and Using Influence to Create Inclusive Engineering Environments

Teacher Summit / Women in STEM
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Director
Student Career Path

★ Not a straight line!
★ Future career may not exist … yet.
★ What do I want to do?
★ What kinds of skills do I need?
★ How do I get there?
Population

Women are….. Everywhere - 50.8% of US Population*

Where women aren’t ….

• represent 19.9% of all engineering undergraduate students in US

Engineering

• women earn 18.7% of undergraduate degrees awarded in engineering***
• Hispanic/African American women combined are 3% UG
• 22.4% engineering PhD degrees awarded***

Workforce

• up to 11% of practicing engineers?

Sources: *U.S. Census Bureau: State and County QuickFacts. Last Revised: Thursday, 14-Mar-2013
***Yoder, B., American Society for Engineering Education, Engineering by the Numbers Report, 2014
Women in Engineering Program

COE UG Women by Ethnicity

- UG White
- UG Hispanic
- UG Asian
- UG Multiracial
- UG Black
- UG Unknown
- UG American Indian/Native

Source: DARS Data Dashboard, Certified Data 2015, College Station Campus only, accountability.tamu.edu
Women in Engineering Program

% Women UG in Engineering Majors @ TAMU

Source: DARS Data Dashboard, Certified Data 2015, College Station Campus only, accountability.tamu.edu
Total Bachelor's Degrees Awarded by Engineering Discipline, by Gender, 2010-2011

xx% = Percentage of degrees awarded to women

High School girls are *more* likely to take biology, chemistry, and pre-calculus than boys… girls *less* likely to take physics!

Percentage of High School Graduates Who Took Selected Math and Science Courses in High School, by Gender, 2005

<table>
<thead>
<tr>
<th>Course</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>90.8</td>
<td>93.7</td>
</tr>
<tr>
<td>Chemistry</td>
<td>62.5</td>
<td>69.7</td>
</tr>
<tr>
<td>Physics</td>
<td>34.8</td>
<td>30.8</td>
</tr>
<tr>
<td>Precalculus</td>
<td>28</td>
<td>30.8</td>
</tr>
<tr>
<td>Calculus</td>
<td>14</td>
<td>13.2</td>
</tr>
<tr>
<td>Engineering</td>
<td>4.6</td>
<td>4</td>
</tr>
</tbody>
</table>

Female Eng. Majors Less Likely to Work as Engineers after Graduation

Occupations of Engineering Majors
One Year After College Graduation, by Gender

1 Includes education, training, and library occupations (except teachers); arts, design, entertainment, sports, and media occupations; and miscellaneous other white collar occupations

2 Includes drafters; food preparation and service occupations; farming, fishing, and forestry occupations; construction and extraction occupations; installation, maintenance, and repair occupations; production occupations; transportation and material moving occupations; military specific occupations; and miscellaneous other blue collar occupations.

Bold numbers indicate a significant gender difference.

Source: Author's analysis of U.S. Department of Education, National Center for Education Statistics, 2008-2009 Baccalaureate and Beyond Longitudinal Study data
What is a Micromessage?

“Micro-inequities” coined by Mary Rowe, PhD - MIT Researcher (1973)

- subtle slights and snubs that devalue individuals
- instances of minute, subtle interactions
- perceived as imbalances to communicate who is in inner circle and not
- indirect offenses that can demoralize a person

How do Micromessages Manifest?

- visual representation
- body language (submissive)
- use of language (“guys”)
- inclusion or exclusion (room layout / location)
- stereotypes (expected roles)
- disregard for ideas / taking ideas (teaming)
- interrupting before women finish
- dominating the conversation
- politics / networking / promotions
Implicit Bias – No one is immune!

Project Implicit  https://implicit.harvard.edu/implicit/
Maura J. Cullen Quote

Think about everything you believe but do not believe everything you think!

Influence

- Parents
- Siblings
- Education
- Culture
- Roles in Culture
- Experience
- Interactions
- Religion
- Pop Culture
- External Influences
- Media
Recognizing Implicit Bias

• Identical resumes for fictitious students
• 50% John / 50% Jennifer
• Male and female researchers and faculty
• John vs. Juan

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Women’s Salary as a Percent of Men’s Salary</th>
<th>Women’s Median Salary</th>
<th>Men’s Median Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical sciences</td>
<td>75.7%</td>
<td>$56,000</td>
<td>$74,000</td>
</tr>
<tr>
<td>Biological /life sciences</td>
<td>85.2%</td>
<td>$52,000</td>
<td>$51,000</td>
</tr>
<tr>
<td>Computer and Information Sciences</td>
<td>88.8%</td>
<td>$71,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>Physical sciences</td>
<td>76.9%</td>
<td>$50,000</td>
<td>$55,000</td>
</tr>
<tr>
<td>Social sciences</td>
<td>90.0%</td>
<td>$63,000</td>
<td>$70,000</td>
</tr>
<tr>
<td>Psychology</td>
<td>84.6%</td>
<td>$55,000</td>
<td>$55,000</td>
</tr>
</tbody>
</table>

# About Stereotype Threat

### Figure 15. Performance on a Challenging Math Test, by Stereotype Threat Condition and Gender

- **Group 1:** Told “Men perform better than women on this test”
- **Group 2:** Told “There’s no gender differences in performance”

*participants were 28 men and 28 women from intro. psy. pool at University of MI. Requirement: at least one semester of calc. GRE math section given on computer.*

Recognizing Stereotype Threat

“being at risk of confirming a negative stereotype”

Research:
- Claude M. Steele
- Joshua Aronson

Intimidation Factors
- Don’t know how to build anything
- Not familiar with procedures / process
- Women scrutinized for making mistakes / technical abilities

*Source: CGO Insights, Framework for Promoting Gender Equity in Organizations, Simmons Graduate School of Management (1999) [http://www.simmons.edu/som/docs/Insights_01.pdf](http://www.simmons.edu/som/docs/Insights_01.pdf)
Recognizing Attribution Theory

“...attempt to explain the world and determine cause of an event or behavior”

Bernard Weiner (1935)
- locus of control
- stability
- controllability

Female Attribution Trends
- *luck or chance played a role

Thoughts:
- *I'm not good/smart enough
- *I need to be perfect

Success = External
Failure = Internal / Personal

Male Attribution Trends
- *I'm inherently smart, successful

Thoughts:
- *out of my control
- *teacher grades hard

Success = Internal
Failure = External / Not Personal

*Source: CGO Insights, Framework for Promoting Gender Equity in Organizations, Simmons Graduate School of Management (1999) [http://www.simmons.edu/som/docs/Insights_01.pdf](http://www.simmons.edu/som/docs/Insights_01.pdf)
Women in Engineering Program
#likeagirl

Frame 1: Equip the Women

Frame 2: Create Equal Opportunity

Frame 3: Value Difference

Frame 4: Culture Change
Engineer: Google It

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Exercise #2

Discussing Societal Factors: Macro-Messages
Confidence vs. Interest
What comes first?
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WE Prepare Her!

- FIRST® LEGO® League
- Project Lead the Way (PLTW)
  - [https://www.pltw.org/](https://www.pltw.org/)
- VEX Robotics Challenge
- Take STEM or CTE Courses
- AP Courses
  - Beware AP Math…
- Take Physics!!!!!
- More Math Please!!!!

FIX something!!
Hands-on
Get a job in High School!
WE will send information about joining project teams throughout the semester. Keep looking for emails from weoutreach@tamu.edu!
Changing the Conversation

• Engineers make a world of difference
• Engineers are creative problem solvers
• Engineers help shape the future
• Engineering is essential to our health, happiness, and safety

NAE Update, Changing the Conversation Report (2013)
Women in Engineering Program

Summary: Optimistic / Inspirational Message

Engineering is:
• infinite/limitless possibilities
• a creative endeavor
• concerned with human welfare
• emotionally satisfying
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Visibility of Diverse Women

weoutreach@tamu.edu

Facebook: www.facebook.com/we.tamu
Twitter: @we_tamu  #wetamu
Exercise #3

What are ways I can contribute to ensure a more inclusive environment?
#1 Intent vs. Impact
- turn to left / turn to right
- comment at meeting

#7 Consistent = Not Always Fair
- splitting the bill

“fairness means treating people differently”
### Allies
- dominant, majority, advantaged
- challenge common practices / beliefs
- MAGNETS

### Bystander Behavior
- bystander apathy / emergencies

Knowing what is right is the easy part, doing what is right tests our courage ...
Components – must haves for young women!

• Gender neutral vs. “Pinkified”
• Context is important!
• Never be afraid to challenge girls, technically
  – remove hostile environment
• Encourage MISTAKES! Lots of them!
• Use mistakes as LEARNING opportunity, not belittling
• Personally invite women/underrepresented students to participate!
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WE IDEAS
Innovate. Design. Engineer. Achieve for Society

WE Build Confidence & Interest
Resources for Teachers

NSF – ENGAGE Students in Engineering
http://www.engageengineering.org/
  • free / research-based resources
    • faculty-student interaction – quick tips / talk to me
    • everyday examples
    • spatial visualization skills

http://www.cmu.edu/teaching/resources/Publications Archives/Internal Reports/culturalvariations.pdf
  • international students

Women in Engineering Pro Active Network (WEPAN)
www.wepan.org/?page=PDWebinars
  • webinars – active learning

American Society of Engineering Education (ASEE)  www.asee.org
Exercise # 4

ME Student Article
Women in Engineering Program
Women in Engineering Program

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