Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

Women in Engineering Program

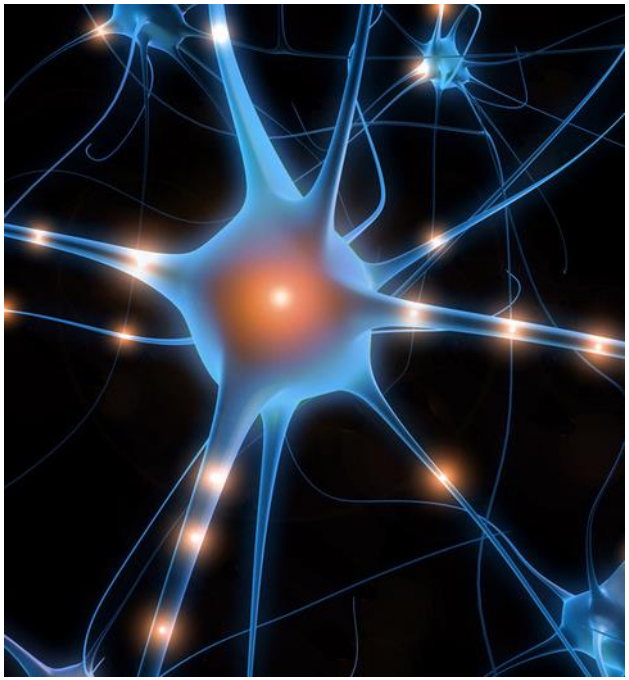
Micromessages:

Recognizing Nuance and Using Influence to Create Inclusive Engineering Environments

Teacher Summit / Women in STEM
January 29, 2016

Presented by
Shawna Fletcher, MS BME
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?

National Data

Population

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

Where women aren't ….

Engineering

- represent 19.9% of all engineering undergraduate students in US
- 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

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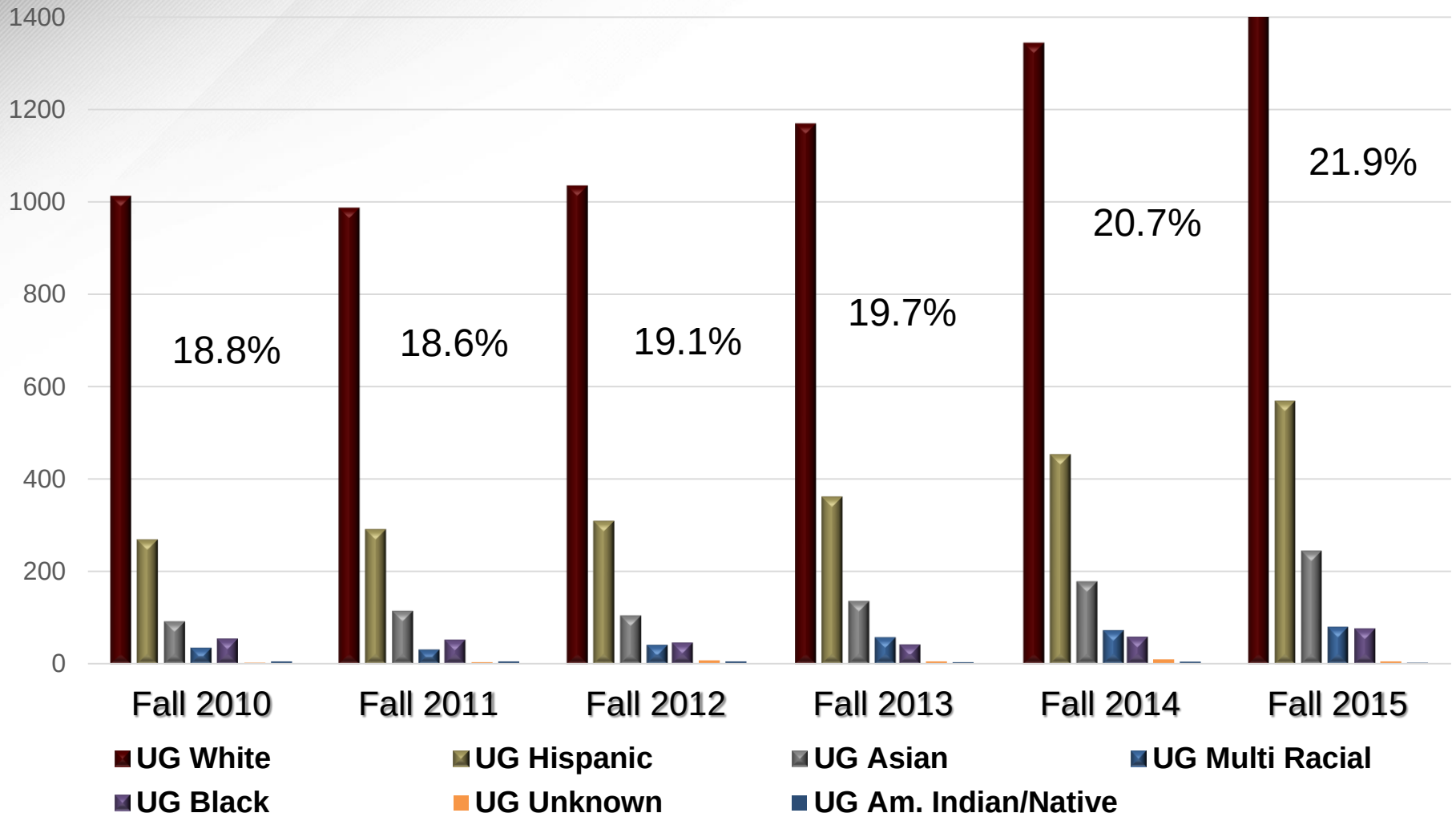
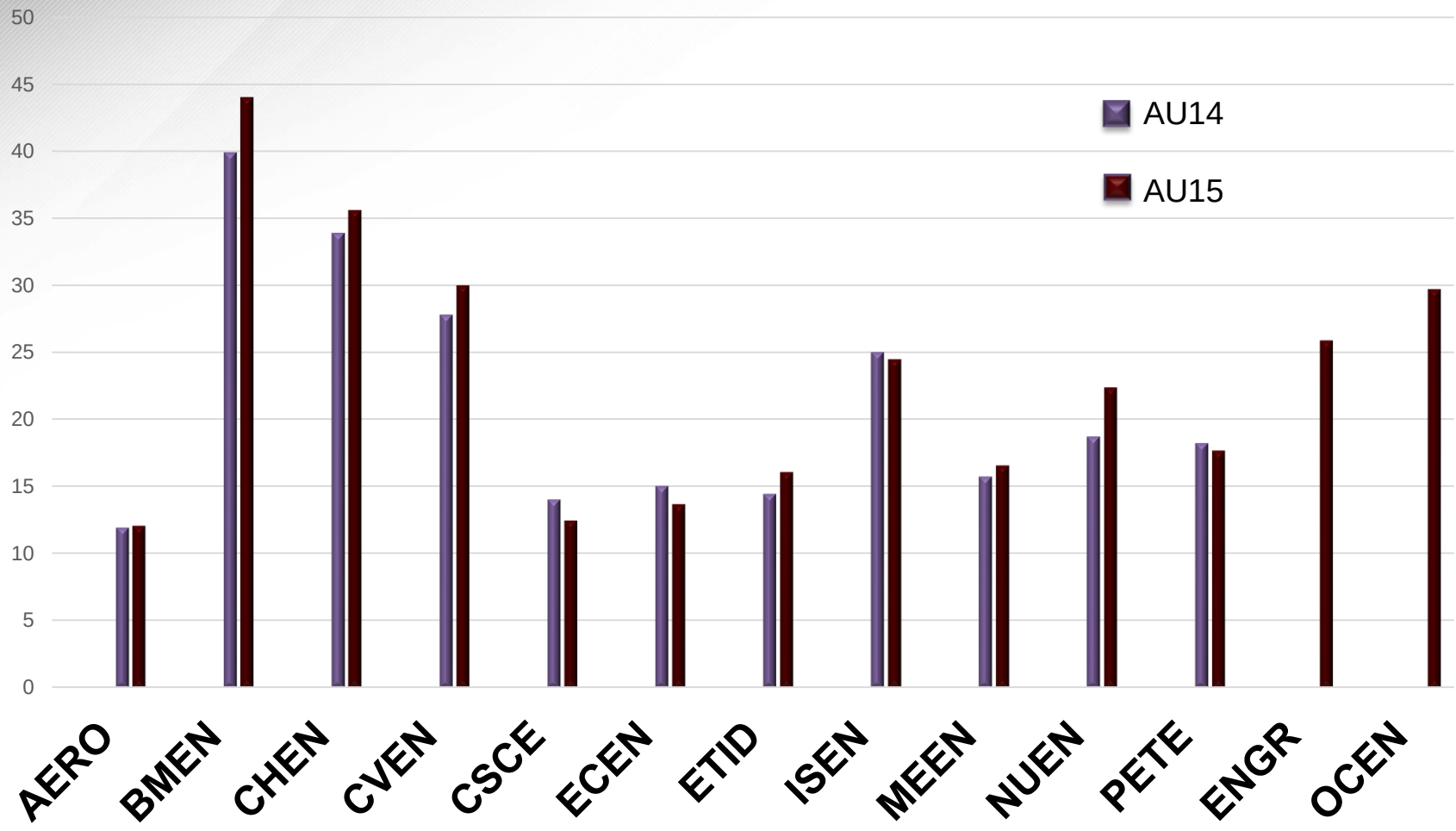
COE UG Women by Ethnicity



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

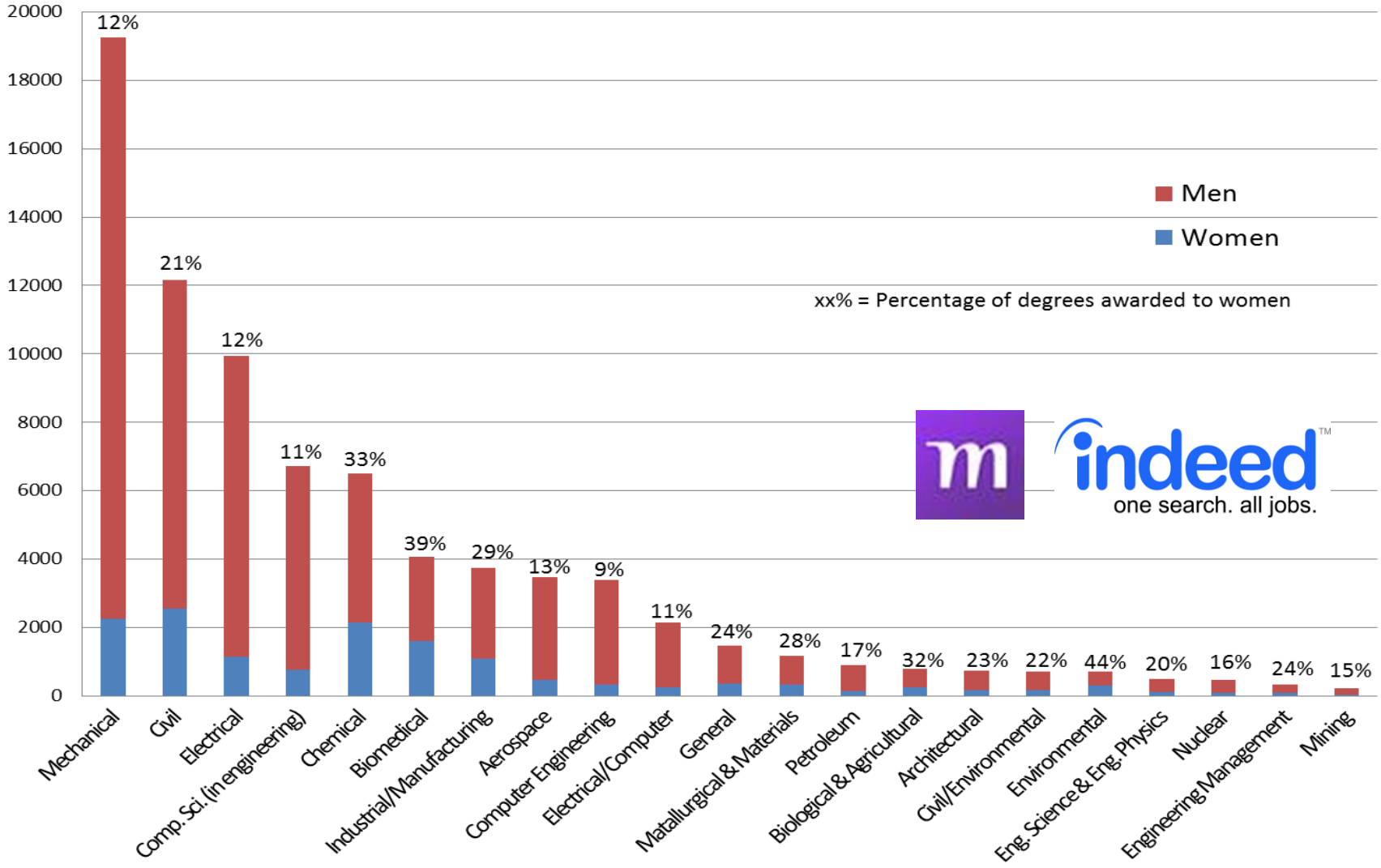
Women in Engineering Program

% Women UG in Engineering Majors @ TAMU



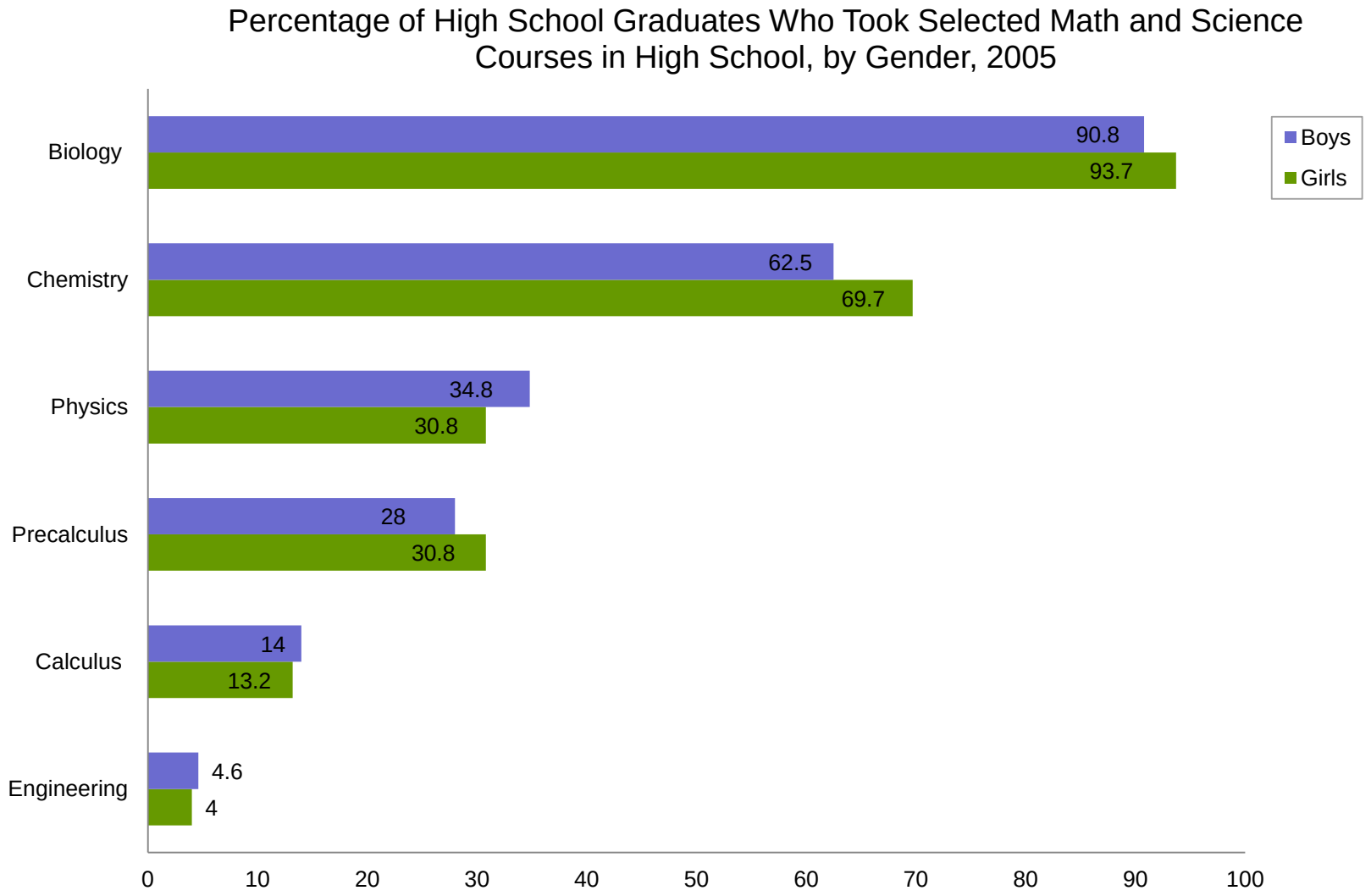
Source: DARS Data Dashboard, Certified Data 2015, College Station Campus only, accountability.tamu.edu

Total Bachelor's Degrees Awarded by Engineering Discipline, by Gender, 2010-2011



Source: Yoder, Brian L. (2012). *Engineering By the Numbers.* American Society for Engineering Education.
http://www.asee.org/papers-and-publications/publications/college-profiles/2011-profile-engineering-statistics.pdf

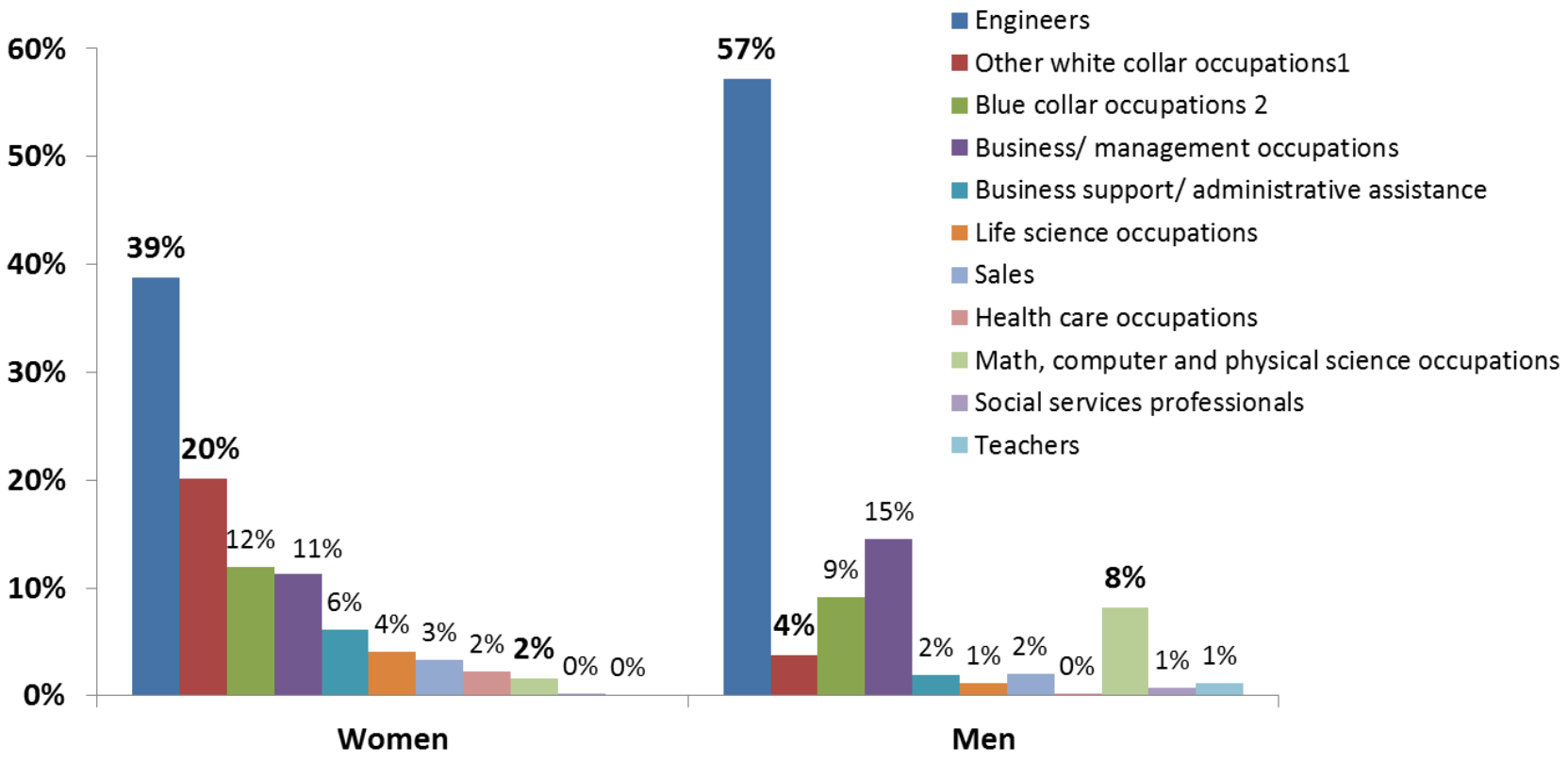
High School girls are *more* likely to take biology, chemistry, and pre-calculus than boys… girls *less* likely to take physics!



*American Association of University Women (AAUW) 2010 report, Why So Few? Women in Science Technology, Engineering and Mathematics

* National Center for Education Statistics (2007), *Digest of Education Statistics.*

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



[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 Longitudal Study* data

Exercise #1

Micromessages in Data

Research-Based Strategies

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?

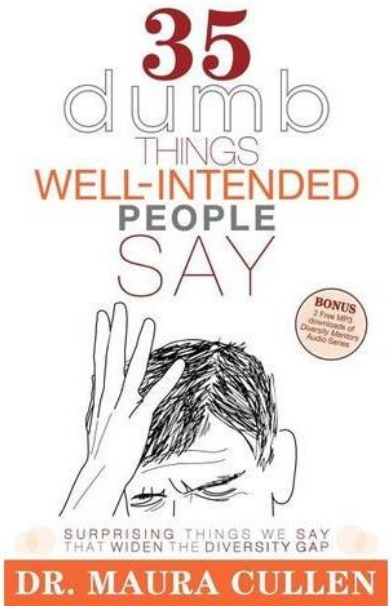
- visual representation
- body language (submissive)
- use of language ("guys")
- inclusion or exclusion (room layout / location)
- stereotypes (expected roles)
- disregard for ideas / taking ideas (teaming)
- interrupting before women finish
- dominating the conversation
- politics / networking / promotions

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

Frame 1: Equip the Women

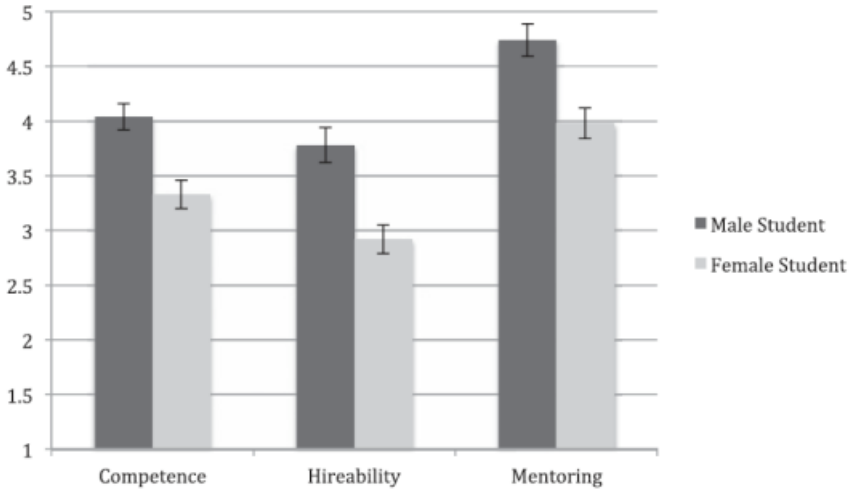
Frame 2: Create Equal Opportunity

Frame 3: Value Difference

Frame 4: Culture Change

Yale Study: Corinne Moss-Racussin et al (2013)

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

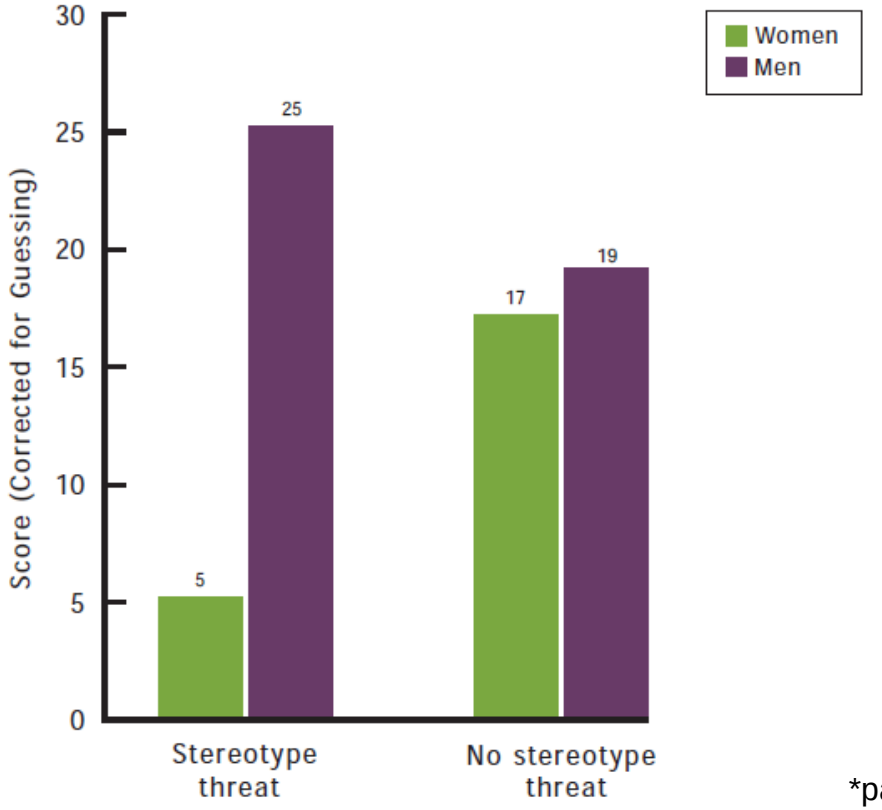


Salaries of Women in Science (As Compared to Men's Salaries) [13]			
Occupation	**Women's Salary as a Percent of Men's Salary**	**Women's Median Salary**	**Men's Median Salary**
Mathematical sciences	75.7%	$56,000	$74,000
Biological /life sciences	85.2%	$52,000	$61,000
Computer and Information Sciences	88.8%	$71,000	$80,000
Physical sciences	76.9%	$50,000	$65,000
Social sciences	90.0%	$63,000	$70,000
Psychology	84.6%	$55,000	$65,000

*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

About Stereotype Threat

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



Source: Spencer et al., 1999, "Stereotype threat and women's math performance," *Journal of Expe Psychology, 35*(1), p. 13.

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.

Frame 1: Equip the Women

Frame 2: Create Equal Opportunity

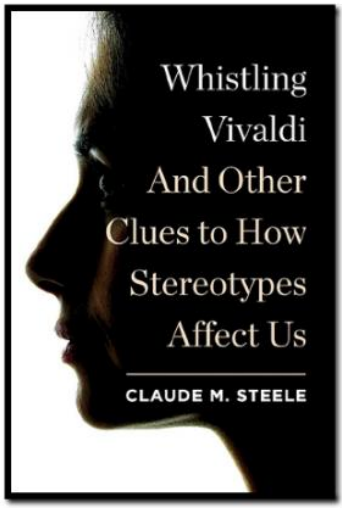
Frame 3: Value Difference

Frame 4: Culture Change

Recognizing Stereotype Threat

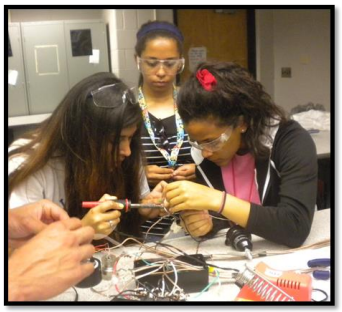
"being at risk of confirming a negative stereotype"

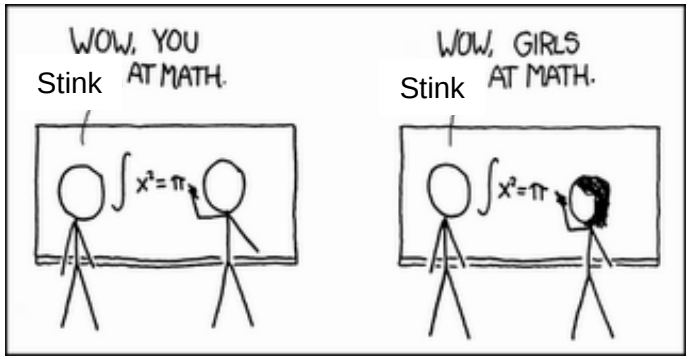
Research:
- Claude M. Steele
- Joshua Aronson



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

Frame 1: Equip the Women

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Recognizing Attribution Theory

"…attempt to explain the world and determine cause of an event or behavior"

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

- ❖ fear of failure AND fear of success
- ❖ internalization detrimental to self confidence (ex: math scores)
- ❖ identity – introducing self

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

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#likeagirl

Frame 1: Equip the Women

Frame 2: Create Equal Opportunity

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Engineer: Google It

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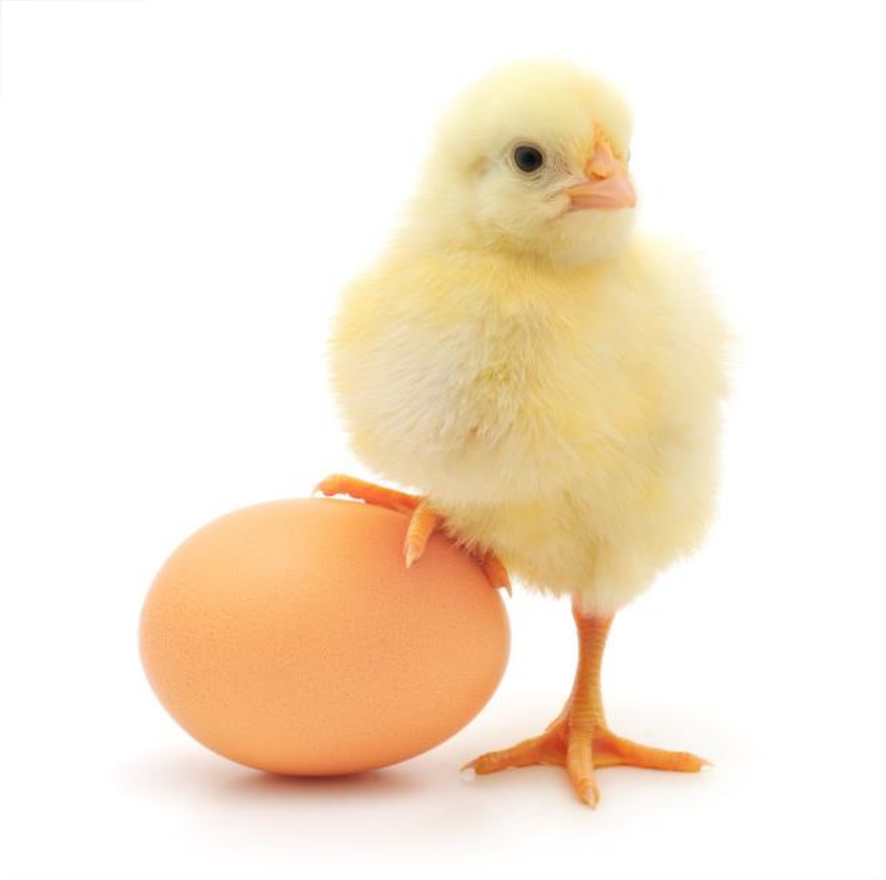
Exercise #2

Discussing Societal Factors:
Macro-Messages

Confidence vs. Interest
What comes first?



Women in Engineering Program

- FIRST® LEGO® League
  - http://www3.usfirst.org/
- Project Lead the Way (PLTW)
  - https://www.pltw.org/
- VEX Robotics Challenge
- Take STEM or CTE Courses
- AP Courses
  - Beware AP Math…
- Take Physics!!!!!
- More Math Please!!!!

WE Prepare Her!

FIX something!!

Hands-on

Get a job in High School!

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Professional Practice

AggiE-Challenge

Aggies Invent

EIC Pop-Up Classes

Project Showcase

FLL FIRST® LEGO® League

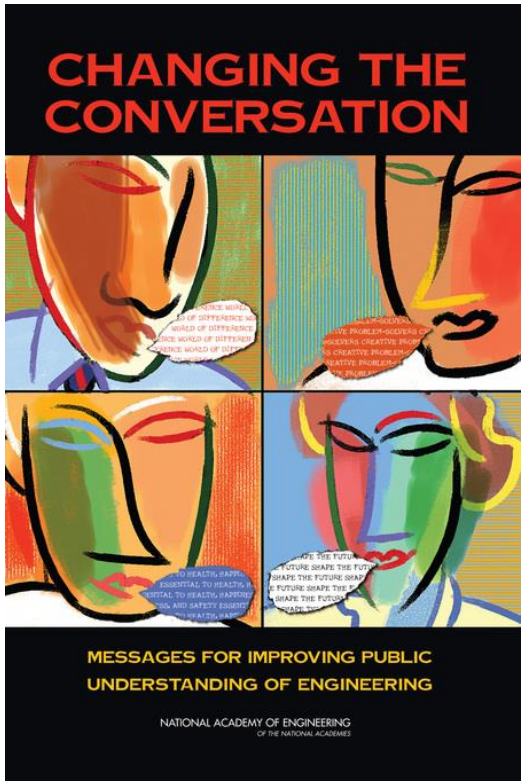
FTC FIRST® Tech Challenge

WE Aggie Research Leadership/Scholars Program

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

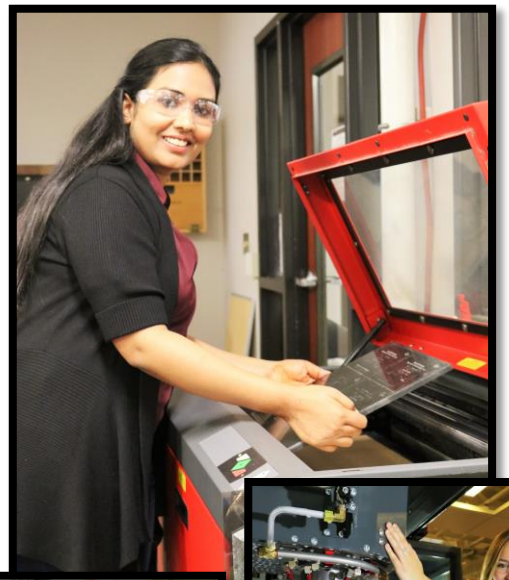


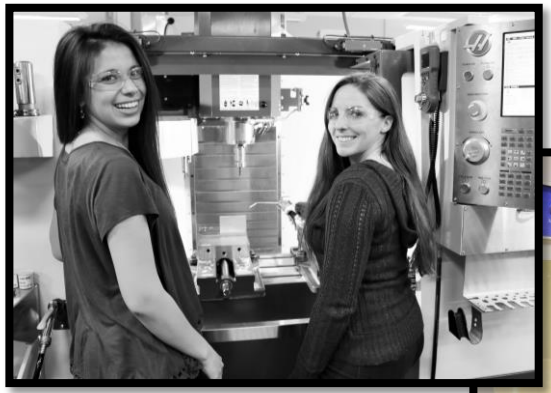
NAE Update, Changing the Conversation Report (2013)

Summary: Optimistic / Inspirational Message

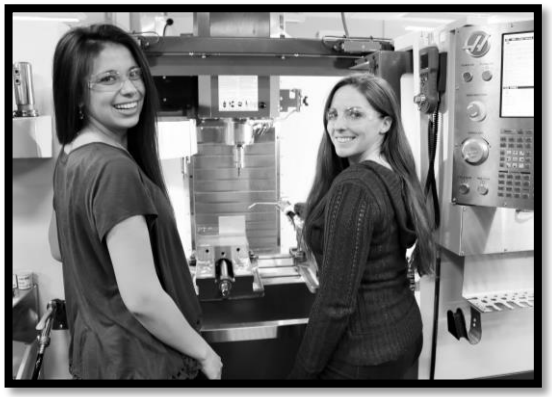
Engineering is:

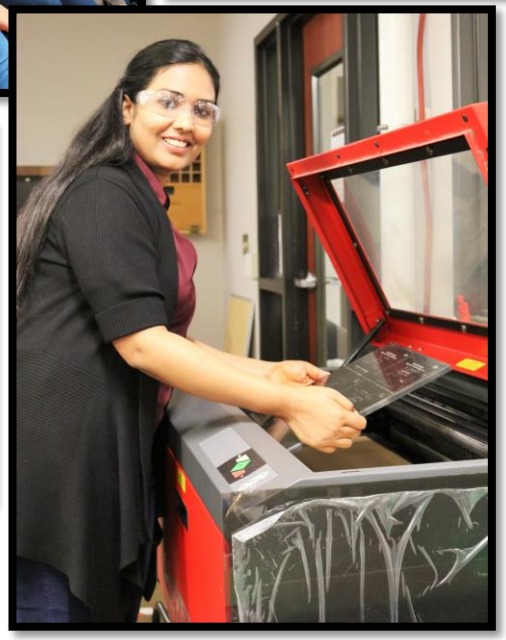
- infinite/limitless possibilities
- a creative endeavor
- concerned with human welfare
- emotionally satisfying





Visibility of Diverse Women





weoutreach@tamu.edu

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

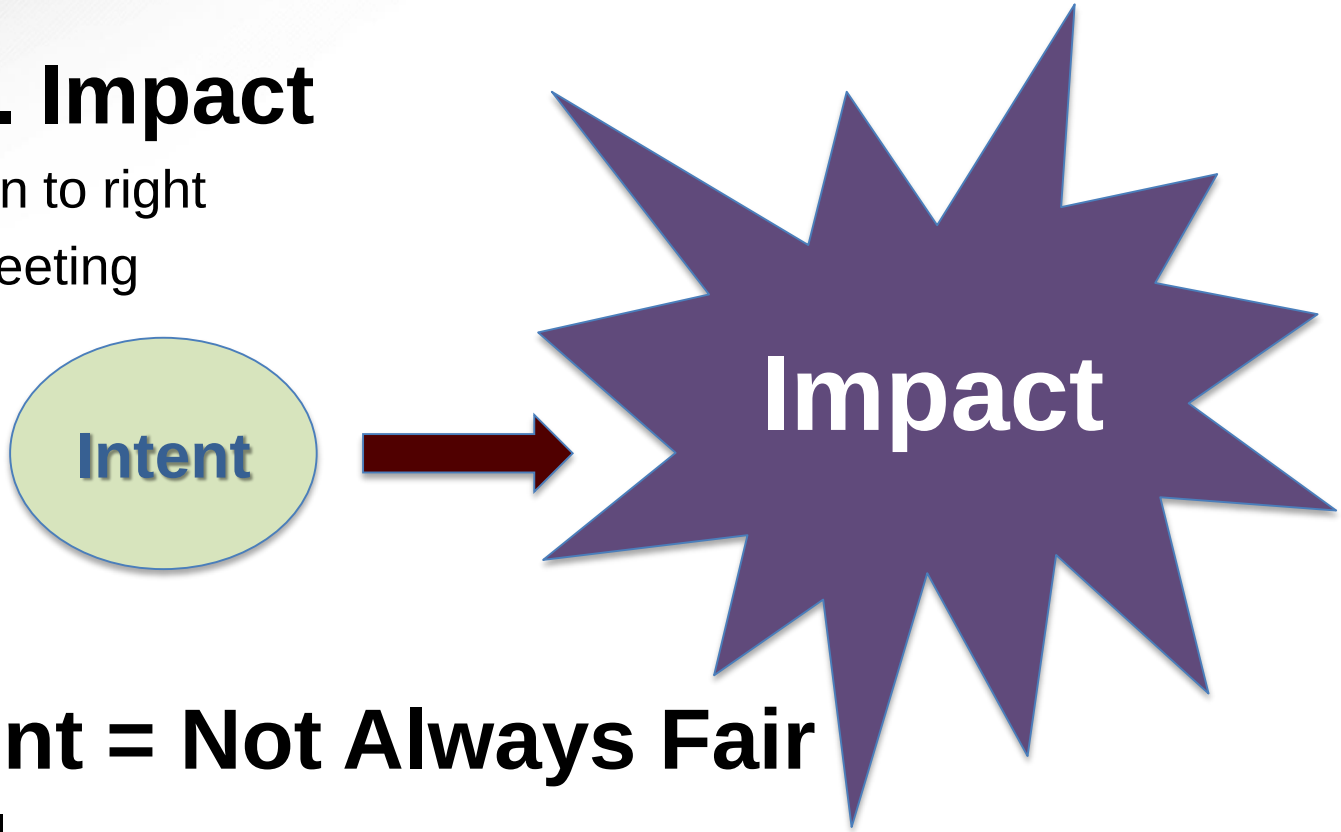
Exercise #3

What are ways I can contribute to ensure a more inclusive environment?

Dr. Maura Cullen – 10 Core Concepts

#1 Intent vs. Impact

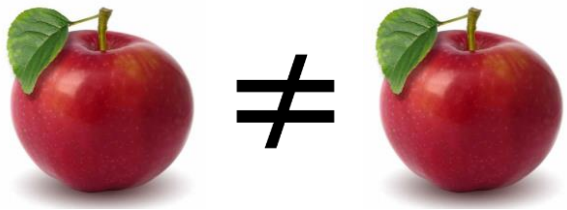
- turn to left / turn to right
- comment at meeting



#7 Consistent = Not Always Fair

- splitting the bill

"*fairness means treating people differently*"



Dr. Maura Cullen - 10 Core Concepts

#8 Allies

- dominant, majority, *advantaged*
- challenge common practices / beliefs
- MAGNETS

#10 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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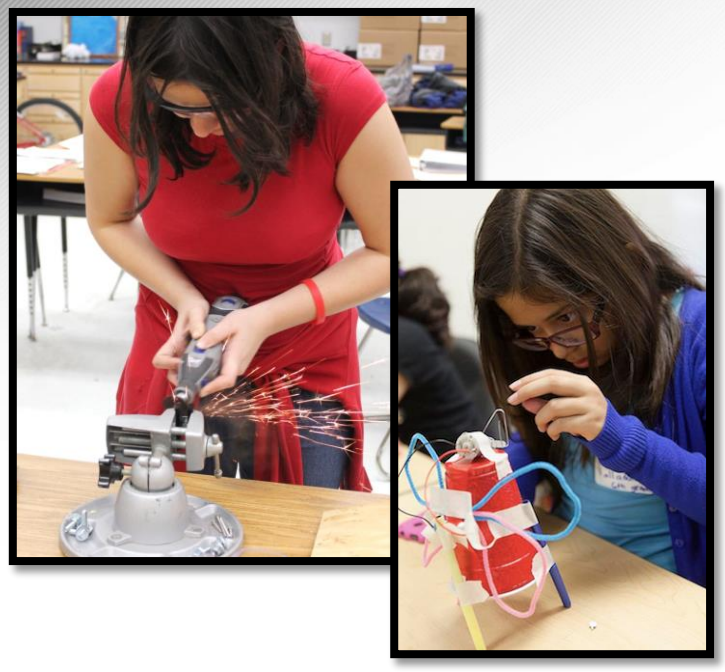
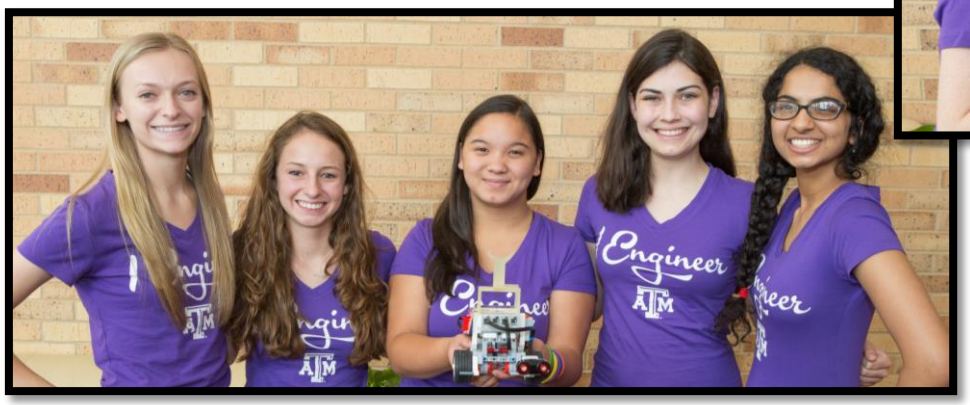


WE IDEAS

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

Carnegie Mellon – Recognizing and Addressing Cultural Variations in the Classroom (2005 report)
http://www.cmu.edu/teaching/resources/PublicationsArchives/InternalReports/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

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