WOMEN IN ENGINEERING:
A SOCIAL PSYCHOLOGICAL APPROACH
(AND TIPS FOR SUCCESS)

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Women in Engineering Day
PLAN FOR TODAY!

• Why are there so few women in engineering?
  • Possible explanations
  • Interventions and latent ability
• Tips for success: Psychological perspective
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Reading achievement test results
(National Assessment of Educational Progress report)
College graduation rates (Grayson, 1999)
Oregon State University
Mechanical Engineering Technology
Class of 1979
Total Labour Force
Physical Science Professionals
Computer Professionals
Technical Occupations
Natural & Applied Sciences
Engineers

(Statistics Canada, 2006 Census)
(Faculty of Engineering at the University of Waterloo, 2012)
POSSIBLE EXPLANATIONS

• Biological or genetic differences
• They don’t work hard enough/aren’t motivated
• Situational factors:
  • Parents, teachers, media
  • Poverty
WOMEN & SPATIAL SKILLS  (FENG, SPENCE, & PRATT, 2007)
DIVERSITY DAY!
STEREOTYPES
Imagine for a moment…

- You’re giving a presentation in front of your classmates
- You stumble through your words
- You’re seen through the lens of a negative stereotype
- The anxiety you feel affects your performance in domains important to you

STEREOTYPE THREAT
A THREAT IN THE AIR

Situation:
Aware of negative stereotype

Extra pressure to avoid confirming the stereotype

Underperformance and withdrawal
EVIDENCE: AFRICAN AMERICANS IN VERBAL ABILITY (STEELE & ARONSON, 1995)

Black and White participants

Diagnostic: Test of verbal ability
   (High stereotype threat)

Non-diagnostic: “not going to evaluate your verbal ability”
   (Low Stereotype threat)

Outcome: Score on challenging verbal problems
Evidence: African Americans in Verbal Ability (Steele & Aronson, 1995)

Score corrected for guessing

Stereotype Threat

High

Low

Whites

Blacks
Evidence: Women in math
(Spencer et al., 1999)

Male and Female participants

Gender differences
  (High stereotype threat)

No gender differences
  (Low stereotype threat)

Outcome: Score on challenging math test
Evidence: Women in math
(Spencer et al., 1999)

Stereotype threat

Score corrected for guessing

High

Low

Men

Women
APPLIES TO OTHER GROUPS

• Older adults and memory (Chasteen et al., 2005)
• White compared to East Asian students in math (Aronson et al., 1999)
  • Asian women in math – which stereotype is activated?
• White compared to Black students in athletic ability (Stone et al., 2002)
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INTERVENTIONS

- Role models and mentors (Dasgupta, 2011)
- Reconceptualizing intelligence and ability (Aronson, Good, & Fried, 2002)
• Think back over your past experiences from high school and so far in university

• Can you think of a time when someone who was more capable than you originally thought?

• Share with the person beside you
LATENT ABILITY

• Jack and Maria both had high school calculus grades of 90%, Maria did worse than Jack on tests at university because of stereotype threat.

• But on tests that removed stereotype threat, Maria actually did better than Jack.

• That’s because Maria earned her 90% while under stereotype threat.

• Her true ability was better than 90%, but it was invisible because of stereotype threat.
LATENT ABILITY

Once stereotype threat was removed, Maria’s true ability could emerge, earning better test scores than we would expect from someone with a 90% high school average.

- This bias can account for a proportion of group differences on important tests:
  - The SAT math test underestimates the math ability of women by 19 to 21 points
  - The SAT verbal and math tests underestimate the intellectual ability of Black students by 39-41 points
LATENT ABILITY
TAKE HOME MESSAGES

• No innate differences between groups!
• Hidden potential
• Why it’s awesome to be an engineer
  • Challenging environment and problems to solve
  • Innovation
  • Inspiring others to do the same
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SPOTLIGHT EFFECT (GILOVICH & SAVITSKY, 2000)

- Overestimate extent to which other people notice one’s appearance or behaviour
- Public speaking
- Asking questions during class
- Everyone feels this way!
- No one notices that you are anxious
IMPOSTER SYNDROME (CLANCE & IMES, 1978)

Discount success:

- “I don’t deserve this, I just got lucky”
- “The admissions committee made a mistake”
- “I only did well because it was an easy class”
- “I’m a fake, someone’s going to find out I’m a fraud”
DEALING WITH IMPOSTER SYNDROME

• Support
• Be aware of these kinds of thoughts
• Do your own reality check
• See others with a more objective eye
• Take your friends and peers’ compliments seriously
• Many people feel this way
IF YOU DON’T WANT TO BE LATE, ENUMERATE!
(KRUGER & EVANS, 2004)

- Planning fallacy (Kahneman & Tversky, 1979)
- How can we fix this?
  - “Unpack” or “enumerate” the project into much smaller, concrete steps
  - Tendency to underestimate amount of time needed goes away
AN AMAZING RECOVERY

- Sam Parrent
- Chronic seizures
- Frontal lobe removed
NEUROPLASTICITY: OUR BRAINS ARE CONSTANTLY CHANGING

• Established brain map from birth...BUT
CHERYL SCHILTZ: REGAINING A SENSE OF BALANCE (NORMAN DOIDGE, THE BRAIN THAT CHANGES ITSELF)

- Lost vestibular system
- BrainPort (Dr. Paul Bach-y-Rita)
- Sensory information sent to brain via device in hat, and terminates in electrodes on tongue
- Residual effect even after device is removed: normal functioning after 1 year of wearing device
- Neuroplasticity: Machine helps recruit other brain pathways that are undamaged
“BORN TO RUN” OR “YEARS OF TRAINING”? 
ENTITY VS. INCREMENTAL MINDSETS

Entity Perspective (Fixed mindset)
Intelligence, ability, and talent are fixed at birth

Incremental Perspective (Growth mindset)
Intelligence, ability, and talent can increase or decrease

Carol Dweck, “Mindset”
ENTITY VS. INCREMENTAL MINDSETs

- Academic achievement
  - Praising intelligence ("you’re so smart!") vs. effort/process ("you put a lot of work into this!") (Mueller & Dweck, 1998)
  - Performance vs. learning/mastery goals
WE ARE “WORKS” IN PROGRESS

- People’s capacity to adapt and change:
  - from couch potato to running the half marathon and climbing the C.N. tower
- Our brains have the same capacity
THANK YOU!