WEPAN 2011-2012 Webinar Series

• **Host:** Diane Matt, Executive Director, WEPAN, Women in Engineering ProActive Network

• **Moderator:** Jenna Carpenter, Ph.D., Associate Dean; College of Engineering & Science, Louisiana Tech University; Director of Professional Development, WEPAN BOD

• **Presenter:** Dr. Joshua Aronson, Associate Professor of Applied Psychology, New York University
Housekeeping Information

• The webinar will use Voice Over Internet. If the sound quality is not good, a teleconference line is available:
  • Phone: 470-200-0305
  • Access Code: 171-832-720
  • Audio Pin: Check your screen once you dial in
• Stay with us if we are temporarily disconnected.
• PowerPoint and recorded webinar will be available following the webinar. We’ll send links.
• Survey following the webinar—please respond!
Asking Questions

- Participant microphones are muted for webinar quality.
- Type your question in the “Question” space in the webinar control panel.
- Jenna Carpenter will moderate the questions.
- Joshua Aronson will respond as time allows.
About WEPAN  www.wepan.org

• WEPAN’s Core Purpose: To propel higher education to increase the number and advance the prominence of diverse communities of women in engineering.

• WEPAN’s Core Values: Knowledge, Collaboration, Inclusion and Leadership

• 700 members in 200 engineering schools, corporations, government and non-profits
WEPAN Knowledge Center
http://wepanknowledgecenter.org

Goal: Increase the number, scope and effectiveness of initiatives to advance women in engineering.

• Catalogued and fully cited resources-1,200+
  Research, reports, data and statistics, agenda papers, bibliographies, best practices,

• Online Professional Community
  Network, collaborate, identify experts, share information
Who’s on the Call Today

• We have 500 registered participants.

• Thank you to ASEE WIED, ASEE ERM, ASEE FYP, NSBE, NAPE Stem Equity Pipeline, NGSP, PGEList, ADVANCE, and many others for helping us spread the word!

• The PowerPoint and recorded webinar will be available. We will send links.
Stereotype Threat:
The Nature and Nurture of Intelligence

Dr. Joshua Aronson
New York University

May 8, 2012
Stereotype Threat
and the
Nature and Nurture of Intelligence

Joshua Aronson
New York University
Webinar, 2012
Why do Women underperform on tests of Math and Science?

Why do Black and Latino students underperform in school and on tests?

How can we make diversity work in the workplace?

How can we help children to engage in school and develop their intellects?
Part One:

Intelligence is both Fragile and Malleable

Operational Definition: Intelligence = IQ Scores, Performance in School, Verbal Fluency, etc.
“Human intelligence is among the most fragile things in nature. It doesn’t take much to distract it, suppress it, or even annihilate it.”

--Neil Postman
Human intelligence is more fragile and malleable than most people think—far more so than the makers of the SAT and other tests would have us believe.
The Fragility of Intelligence

Some social factors that impair intelligent thought

- Interpersonal Chemistry (feeling smarter, funnier, etc. with certain people)
- Threatened Safety (Sharkey, 2009)
- Threatened Belongingness (Baumeister, 2002)
- Stereotype Threat/Identity threat (Steele & Aronson, 1995)
Stereotype/Identity Threat

Apprehension arising from the awareness of a negative stereotype or personal reputation in a situation where the stereotype or identity is relevant, and thus confirmable

– everyone experiences this in some form
Examples of Identity Threat

- Jewish person in a money context
- African American Taking an IQ test
- Woman called upon in math class
- George W. Bush and public speaking
“They misunderstood me”
--G.W. Bush, Nov 6, 2000

Estimate Bush’s SAT Score
Average estimate = 1080   Bush’s Actual Score = 1330
Stereotype Threat: No Explicit Bigotry Required
Stereotype Threat
Anecdotal Evidence

“When I talk in class, I feel as though I’m totally on stage, like everyone’s thinking, ‘oh what’s the Black girl going to say?’ But I don’t speak up in class much anymore, so I guess it’s not a big deal.”

—Stanford Undergraduate
“Group work was a nightmare. I could tell that no one thought my ideas were any good because I’m Latina.”

—NYU Undergraduate
Stereotype Threat
Anecdotal Evidence

“Everyone expects me to be good at math because I’m Asian, so I feel extra stupid because I’m not so good at math.”

—NYU Undergrad
Laboratory Experiment on Stereotype Threat


- **Method:** Reducing Evaluative Scrutiny
- **Measure:** Blacks’ and Whites’ Verbal GRE Performance
Verbal Test Performance

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<th># of items solved</th>
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<td>3</td>
</tr>
<tr>
<td>whites</td>
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"Measuring Your Ability"  "Not Measuring Your Ability"
Verbal Test Performance

# of items solved

"Measuring Your Ability"  "Not Measuring Your Ability"

blacks whites blacks whites

1 3 5 7 9 11 13 15

"Measuring Your Ability"  "Not Measuring Your Ability"
Verbal Test Performance Corrected for SAT

- Blacks
- Whites

Sterotype Threat: # of items solved

- Blacks
- Whites

No Stereotype Threat: # of items solved

- Blacks
- Whites
Laboratory Experiment on Stereotype Threat

Steele & Aronson (1995)

Method: Inducing the Relevance of Race

Measure: Blacks’ and Whites’ Verbal GRE Performance
Verbal Test Performance

- **Blacks**:
  - Asked to Indicate Race: 4 items solved
  - Not Asked to Indicate Race: 9 items solved

- **Whites**:
  - Asked to Indicate Race: 7 items solved
  - Not Asked to Indicate Race: 9 items solved
Additional Studies Finding Performance Effects

- Women Taking Math Tests
- Women working with computers
- Latinos taking verbal tests
- Elderly taking short-term memory tests
- Low SES Students taking verbal tests
- Blacks and Miniature Golf
- Women taking tests of Political Knowledge, Driving, Chess
- White males taking tests of social sensitivity
- Princeton Students from Non-preppy backgrounds on math tests
- White Males Taking Math Tests
When White Men Can’t Do Math
When White Men Can’t Do Math
Key Conclusions From 350 Published Studies

• Impairment occurs both on IQ tests and in terms of GPA; Costs women on average 20-30 SAT points; Blacks 40 pts.
• Impairment on tests results from anxiety, arousal, reduced working memory capacity, impaired self-regulation; not typically a function of reduced effort; induces high blood pressure
• Can affect elite or non-elite students
• Is less likely when there is “critical mass”
• ST is much more likely to affect African Americans than immigrant black students; gender effects more likely in US
Stereotype Threat Effects in the “Real World”
Educational Testing Service
Field Study:
The AP Calculus Test
ETS Field Study:
Asking Gender Before Taking AP Calculus Test Hurts Girls

Inquiry Before Inquiry After
AP  Formula Score
Female
Male

(Stricker, 2002). *Journal of Applied Social Psychology.*
Educational Testing Service Study: Asking Gender Before AP Calculus Test Hurts Girls, Helps Boys
Field Experiment: Women in the Science Pipeline

Highest Level Calculus Students
Field Study: Women in the Science Pipeline

Highest Level College Calculus Students

Good, Aronson, & Harder (in press) *Journal of Applied Developmental Psychology*
Field Study: Women in the Science Pipeline

Advanced Level Women Outperform Advanced Men in Calculus When Threat Reduced

Good, Aronson, & Harder (2008) *Journal of Applied Developmental Psychology*
“No circle is more vicious than the one having to do with intelligence. Children who may be only a little behind their peers to begin with tend to avoid those things that could have made them a little smarter. As a result they fall further and further behind. Meanwhile the kids who started out a little ahead are doing push-ups with their brains.”

Judith Rich Harris
Part Two:

Using this Understanding to Improve Performance, Motivation and Learning
Reducing Stereotype Threat
Mindset Matters
The Growth Mindset
Can a growth mindset improve math test scores among black school children (aged 9-13)?

Method: Black North Carolina students primed for race or not, given growth mindset or not.

Measure: Math Test Performance (EOG)
Math Test Performance
Black Grade School Students

![Graph showing Math Test Performance for Black Grade School Students with and without RACE PROMPT. The graph compares the percentage of items solved under two conditions: GROWTH MINDSET and NO GROWTH MINDSET. The data indicates a higher percentage of items solved when a RACE PROMPT is used, especially in the GROWTH MINDSET condition.](image_url)
Reducing the effects of Stereotype Threat In the real world: Shaping implicit theories

Question: Can getting people to believe in expandable intelligence reduce effects of stereotype threat on GPA?

• Method: Attitude change
• Measure: End of year GPA
Year End Follow-Up:

GPA

Reducing Stereotype Threat in Middle School: A field Intervention

Question: Can psychological intervention raise test scores of minority students?

- Method: mentoring study; attitude change
- Conditions:
  - Malleability of intelligence
  - Role Models: senior students who stress the normality of early difficulty
  - Control (drug abuse message)
- Measure: Texas Assessment of Academic Skills (TAAS)
7th Grade Reading TAAS--Latinos

7th Grade Girls’ Math TAAS

Identity Salience
Spatial Ability Test Performance

- Largest sex differences: Spatial Ability
- May account for most of the math test score gap
- Testosterone?
- Trainability
- Can Identity Salience move scores around?
A meta-analysis containing 286 data sets and 100,000 subjects found a highly significant male advantage for mental rotation; this pattern remains stable across age and has not decreased in recent years.
Identity Salience Influences Women’s Mental Rotation Performance

Identity Salience Influences Women’s Mental Rotation Performance

Identity Salience Influences Mental Rotation Performance

![Graph showing VMR scores for different groups: Gender, Elite College Student, and Control. Women and Men are compared. The graph indicates higher VMR scores for Men compared to Women in the Gender group, and similar scores for Women and Men in the Elite College Student and Control groups.](image-url)
Identity Salience and College Major Interest

- Middle and High School Students at a college information fair
- Filled out “conformist attitudes” (experimental) or “cafeteria food” (control) questionnaire
  - “I like to think of myself as a trailblazer rather than a follower”
  - “I don’t like cafeteria food as much as a home cooked meal”

DV: How many students requested information pamphlets about STEM majors?
Identity Salience and College Major Intentions

Findings:

1. All students expressed negative attitudes toward conformity and cafeteria food.

2. No effect on boys

3. Girls who received the conformity measure before selecting pamphlets were twice as likely to express interest in STEM majors; correlated with expression of nonconformist attitudes
How Many Girls Requested Information Pamphlets on STEM Majors?
Identity Salience In the School

Crellin Elementary School, a poor school on the Maryland West Virginia border; could be the best school in America.

Went from 0% proficiency to 100% proficiency in 3 years after new principal (50% of students reached advanced level)

7 years after graduating from Crellin, graduates comprise 75% of the students in AP classes in high school despite being 1/3 the size of the other feeder elementary schools
Identity Salience In School

- Many lessons to be learned from Crellin
  - Students do science rather than study science, so they identify themselves as scientists very early
  - Principal and teachers constantly remind them that they are “Crellin students” and thus are special:
    - “Crellin girls tie their own shoes”
    - “Crellin girls don’t say ewww”
    - “Crellin students work hard, etc.”
    - “We don’t do that here at Crellin”
Meaningfulness
Doing Good Science that Does Good: The Importance of Meaning

Example: We Care Solar School
Solar Students
Solar Students
Solar Students
Solar Students
Solar Students
Meaning/Relevance

• Harackiewicz had students in 9th grade science classes evaluate their expectations for success in their science class. Students were then randomly assigned to one of two conditions:
  
• 1) Control condition: Students wrote a brief essay summarizing the material they were covering in science class

• 2) Experimental condition: Students wrote about the value and usefulness of the material they were covering in class, and how it might relate to their own life.
Changing Meaning to Maintain Motivation in the Face of Threat

Essay paradigm: Minority student receives harsh constructive feedback on essay about why children should want to go to College.

Meaning Manipulation:
“published in a book”
vs “published in a book to be distributed to children in Harlem”

How many students mail in revised essays?
How many students send a revised essay after getting harsh feedback on first draft?

Number of second drafts returned

- Publish in Book
- Publish in book for children
Conclusions

• Situations that affect mindsets can have profound effects on intelligent thought, motivation, and ultimately on abilities, because intelligence is both fragile and malleable; sometimes all it takes is a little nudge

• “Bell-curving” situations

• Nature may give small differences, but it is up to culture—that is us—to either widen or narrow them
"By nature emplanted, for nurture to enlarge"

Richard Mulcaster, 1581
First Headmaster of Merchant Taylors' School in London
Questions?

• Remember:
  – Type your question in the “Question” space in the webinar control panel.
  – The presenter will respond as time allows.
References

• Reducing Stereotype Threat website: http://reducingstereotypethreat.org/

• References on “Reducing Stereotype Threat”: http://reducingstereotypethreat.org/bibliography.html

• Dr. Aronson’s website: http://steinhardt.nyu.edu/faculty_bios/view/Joshua_Aronson
Additional References


Additional References


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