



Dr. Joshua Aronson

Stereotype Threat and **The Nature and Nurture of Intelligence**

Dr. Joshua Aronson
New York University

May 8, 2012

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



WEPAN

Women in
Engineering
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*Transforming culture
in engineering education*

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- **Participant microphones are muted for webinar quality.**
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- **Jenna Carpenter will moderate the questions.**
- **Joshua Aronson will respond as time allows.**

About WEPAN www.wepan.org

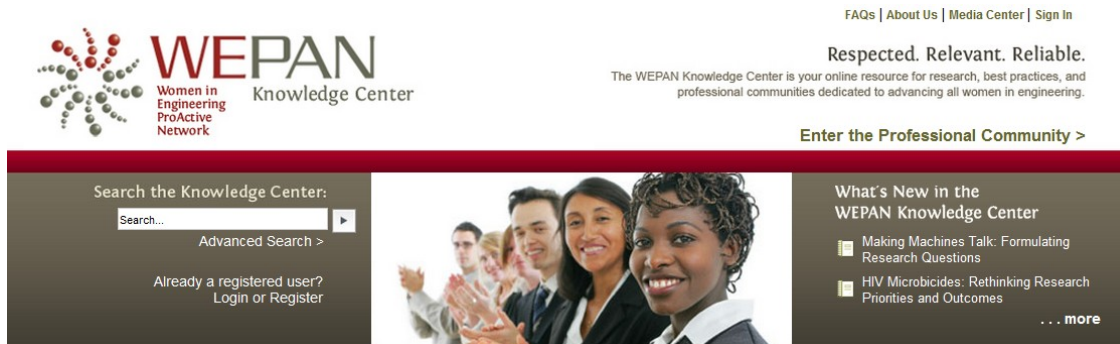
- **WEPAN's Core Purpose:** To propel higher education to increase the number and advance the prominence of diverse communities of women in engineering.
- **WEPAN's Core Values:**
Knowledge, Collaboration, Inclusion and Leadership
- **700 members in 200 engineering schools, corporations, government and 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.**



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Stereotype Threat: The Nature and Nurture of Intelligence

**Dr. Joshua Aronson
New York University**

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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?

Intelligence is both Fragile and
Malleable

“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 underestimated me”

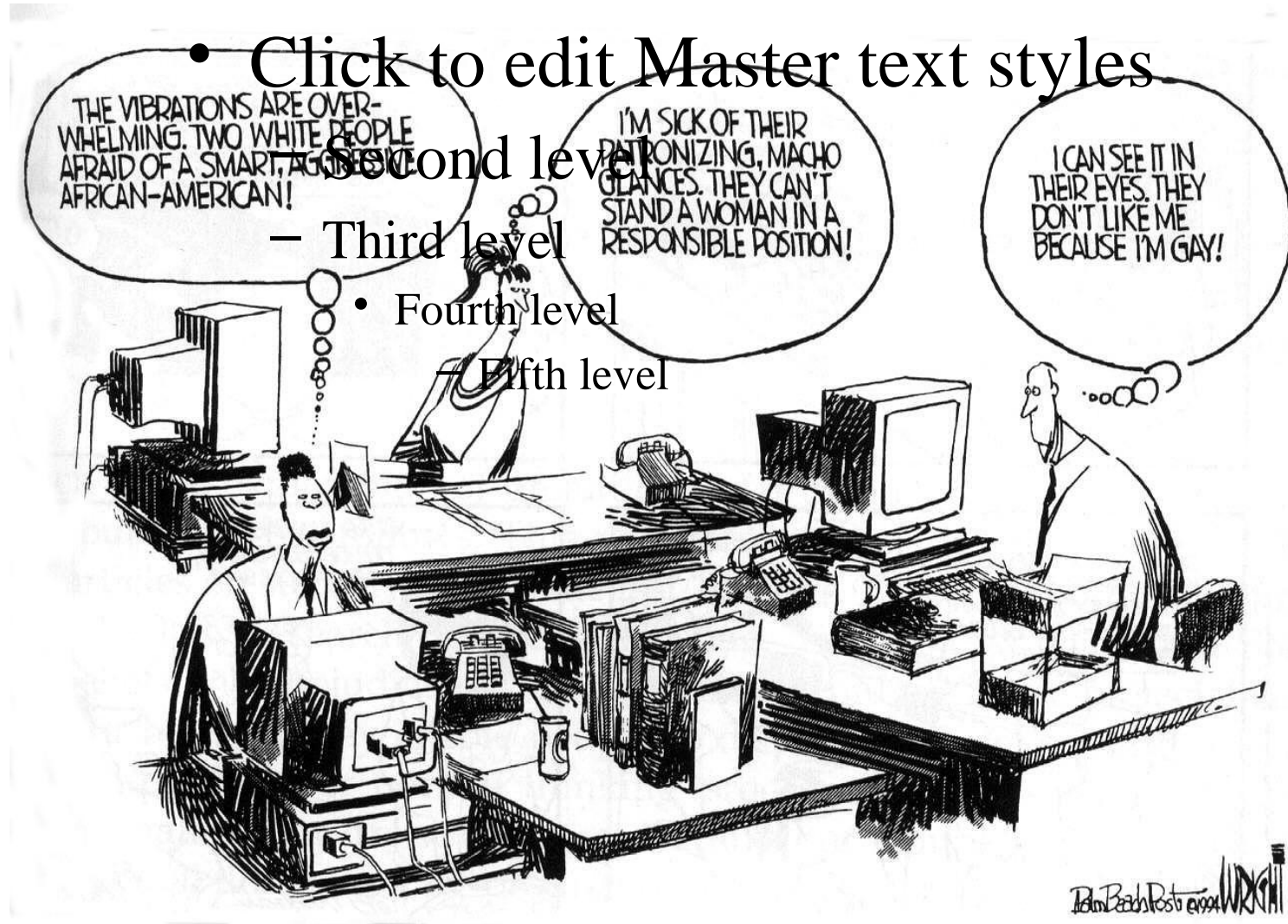
--G.W. Bush, Nov 6, 2000



Estimate Bush's SAT Score

Average estimate = 1080 Bush's Actual Score = 1330

Stereotype Threat: No Explicit Bigotry Required



Stereotype Threat

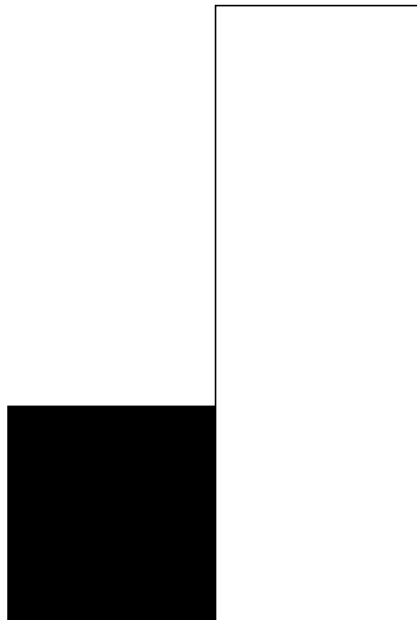
Anecdotal Evidence

Laboratory Experiment on Stereotype Threat

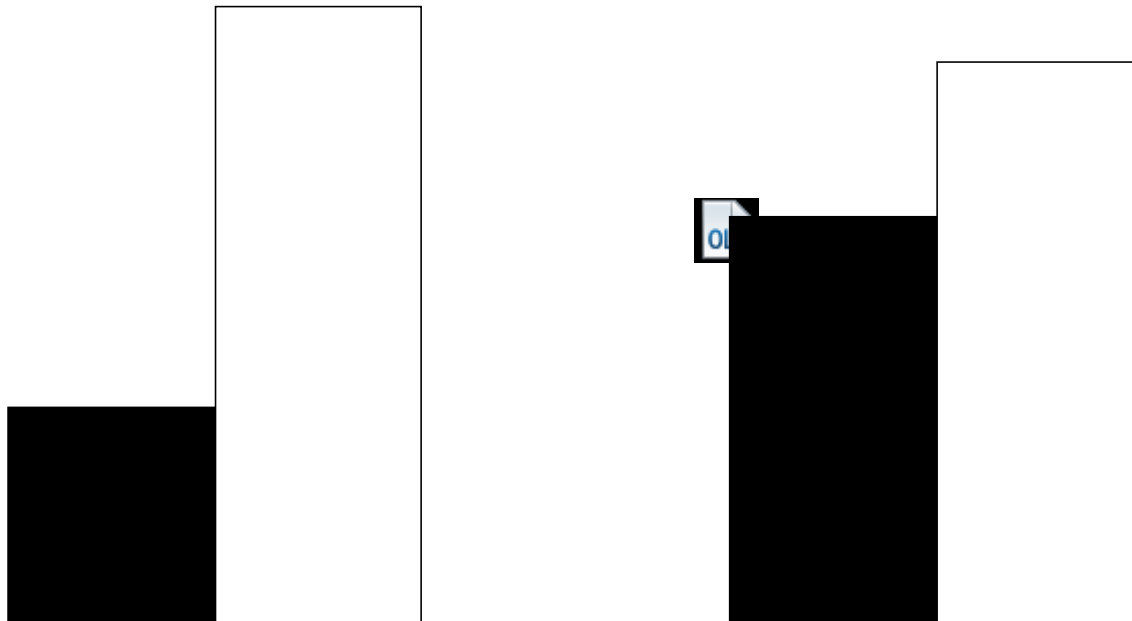
Steele & Aronson (1995). *Journal of Personality and Social Psychology*.

- Method: Reducing Evaluative Scrutiny
- Measure: Blacks' and Whites' Verbal GRE Performance

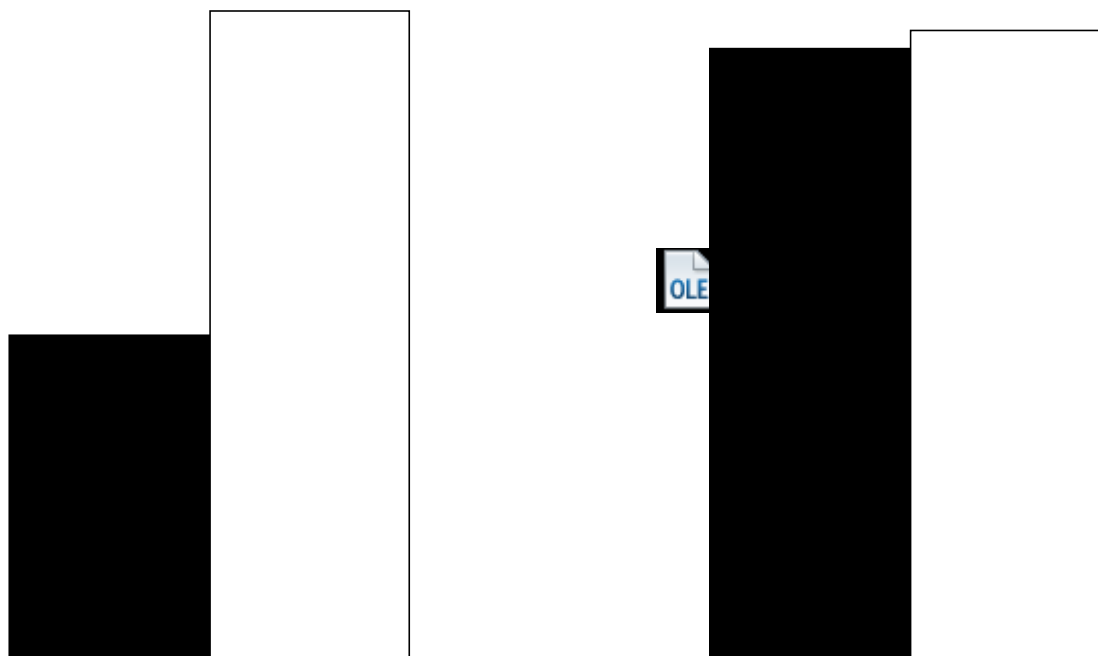
Verbal Test Performance



Verbal Test Performance



Verbal Test Performance Corrected for SAT



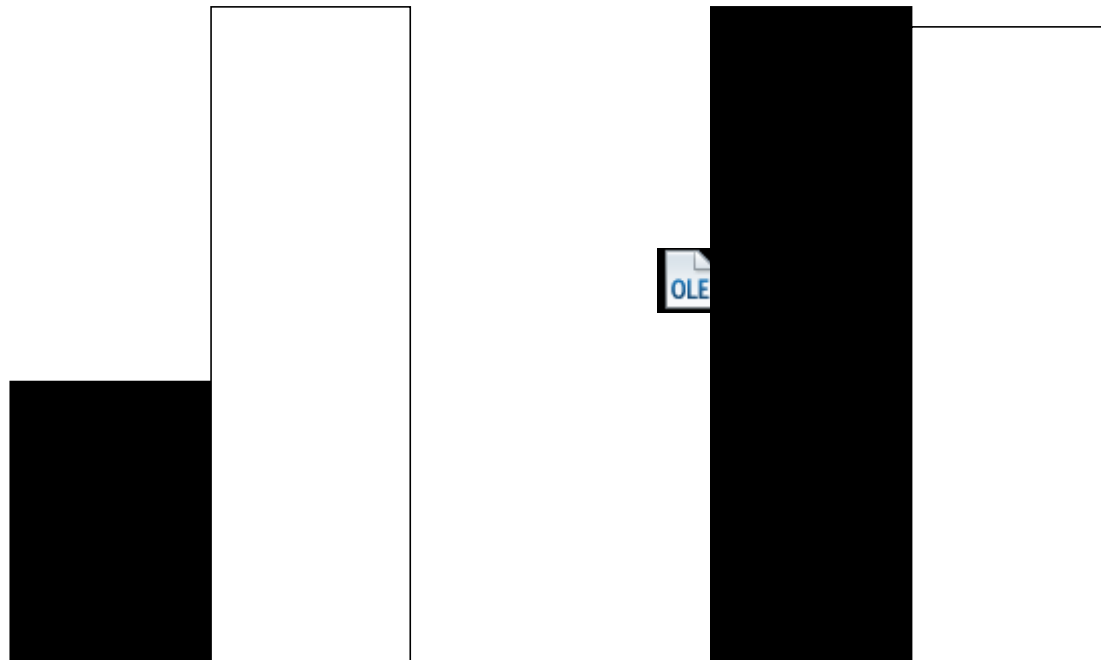
Laboratory Experiment on Stereotype Threat

Steele & Aronson (1995)

Method: Inducing the Relevance of Race

Measure: Blacks' and Whites' Verbal GRE
Performance

Verbal Test Performance

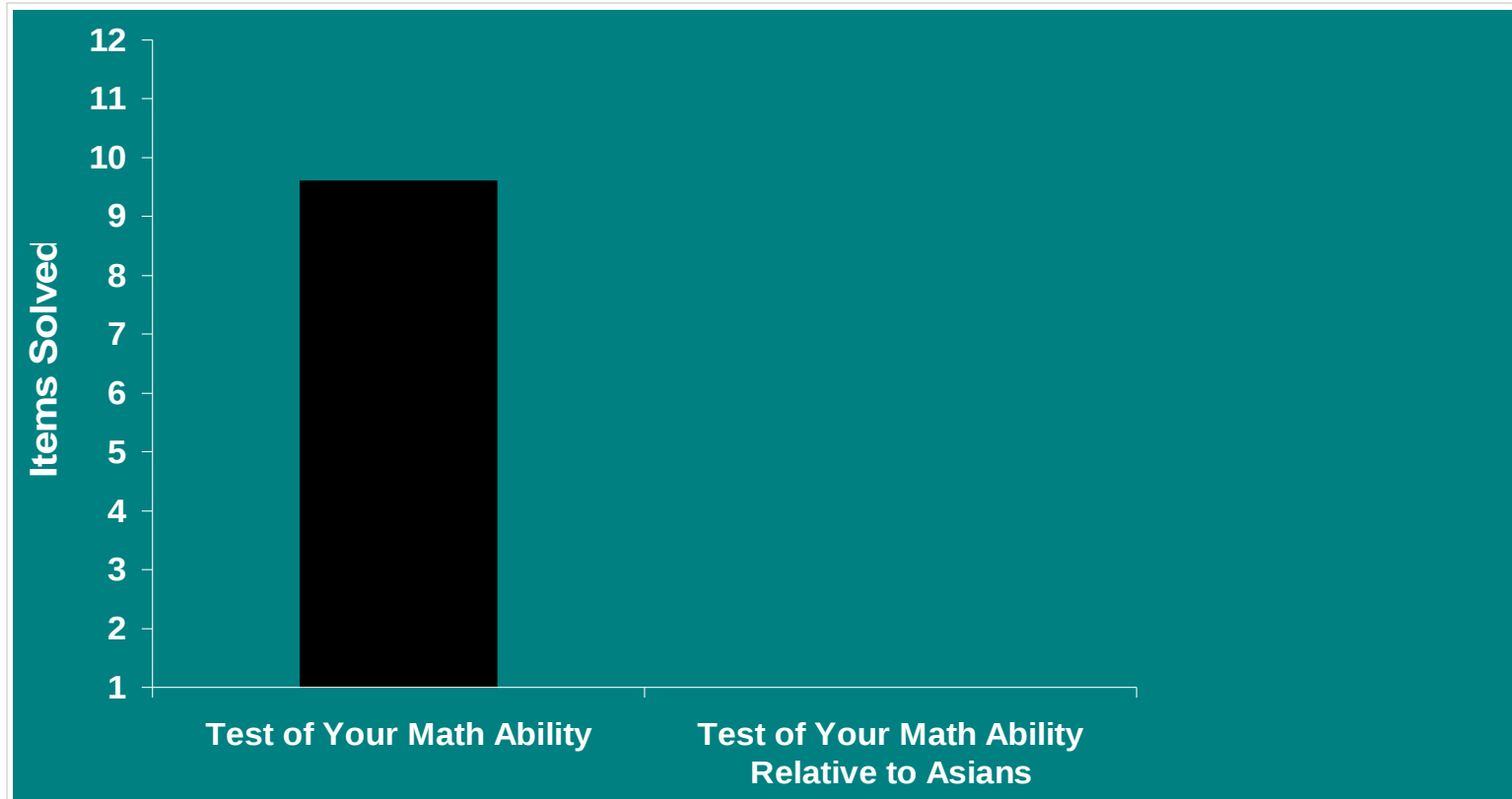


Additional Studies Finding Performance Effects

- 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

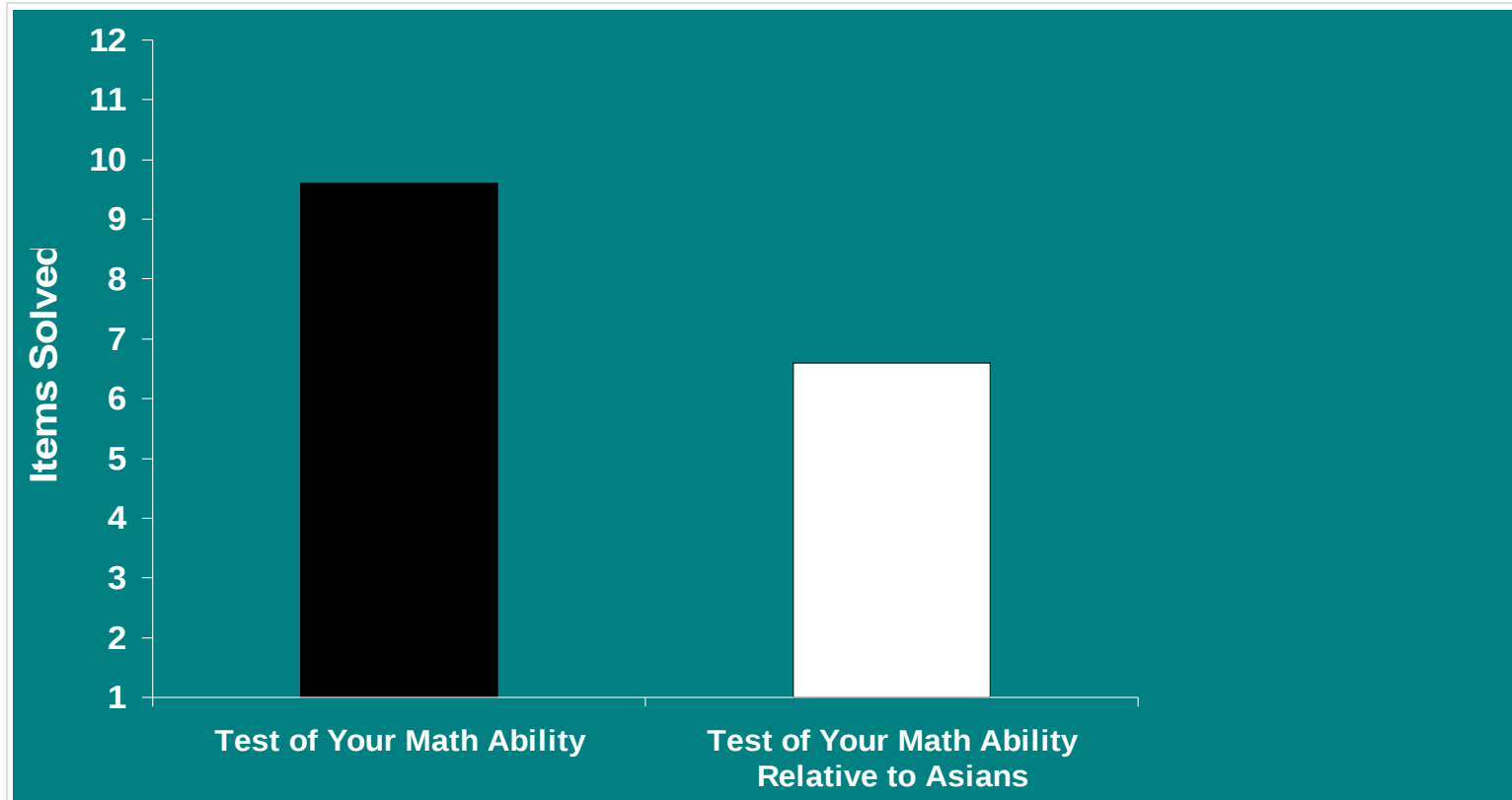
When White Men Can't Do Math

Aronson, et al., (1999). *Journal of Experimental Social Psychology*.



When White Men Can't Do Math

Aronson, et al., (1999). *Journal of Experimental Social Psychology*.



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

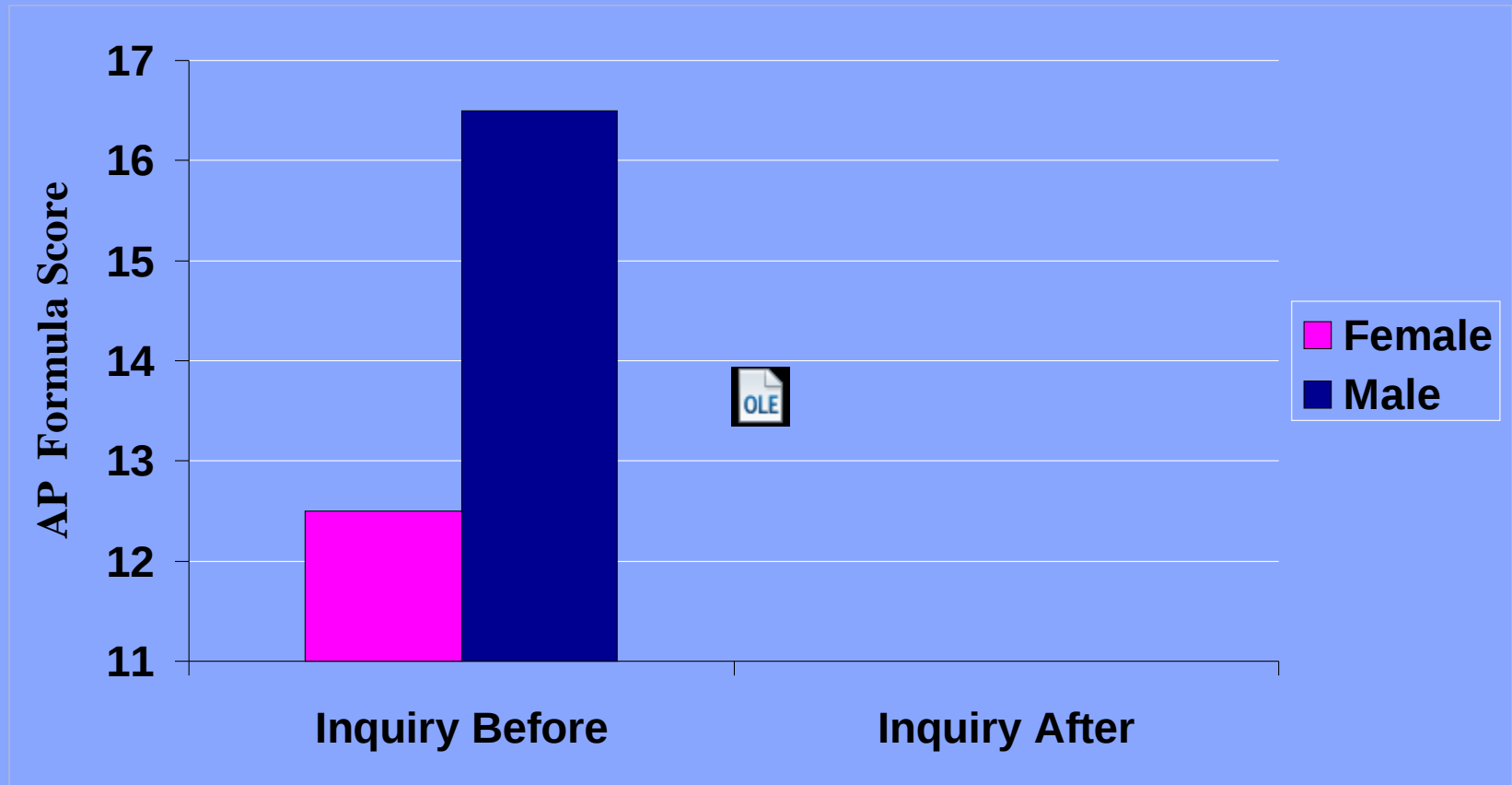
Stereotype Threat Effects
in the
“Real World”

Educational Testing Service Field Study: The AP Calculus Test

Asking About Gender or After Before
Taking AP

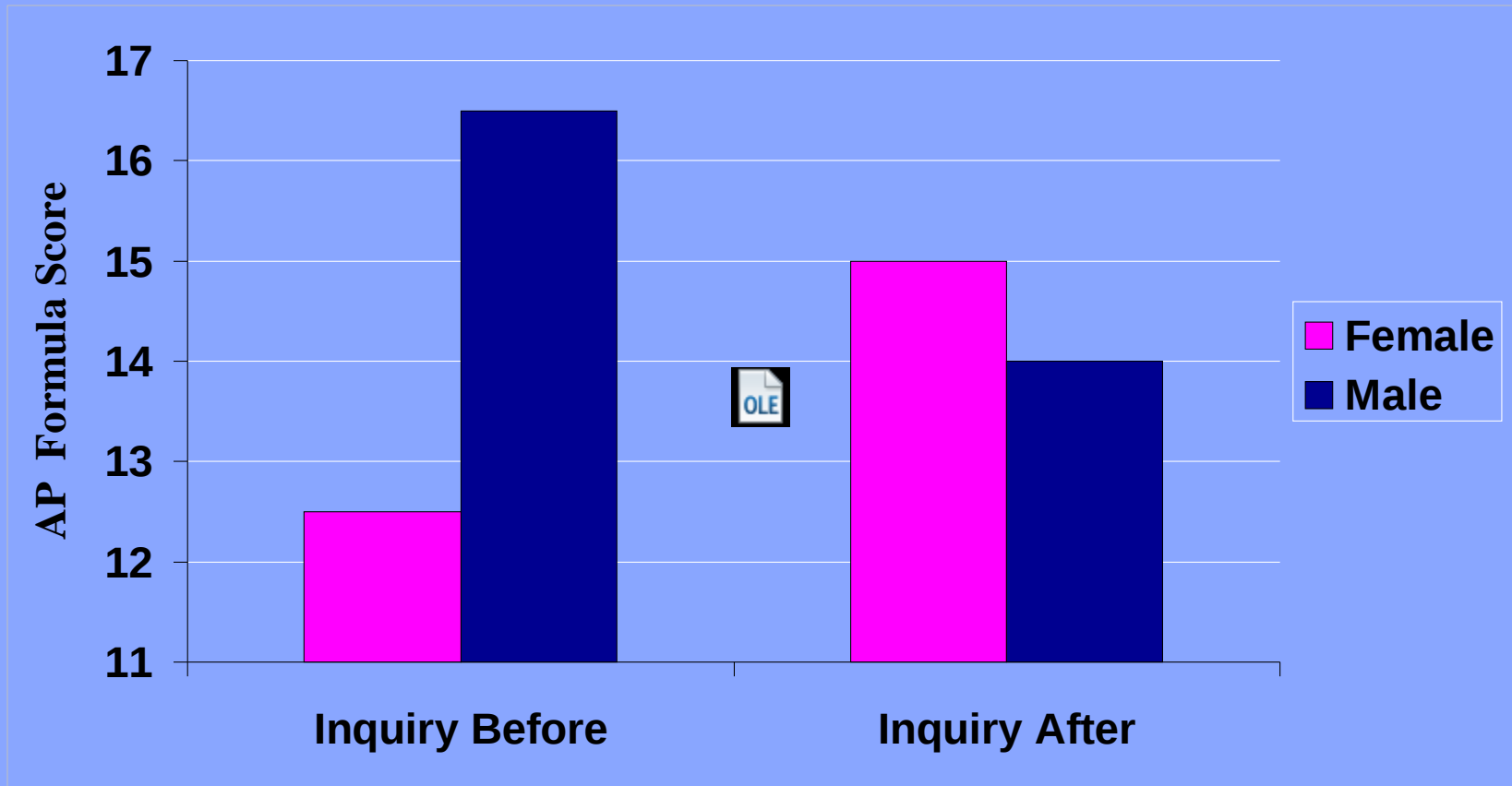
ETS Field Study:

Asking Gender Before Taking AP Calculus Test Hurts Girls



(Stricker, 2002). *Journal of Applied Social Psychology*.

Educational Testing Service Study: Asking Gender Before AP Calculus Test Hurts Girls, Helps Boys

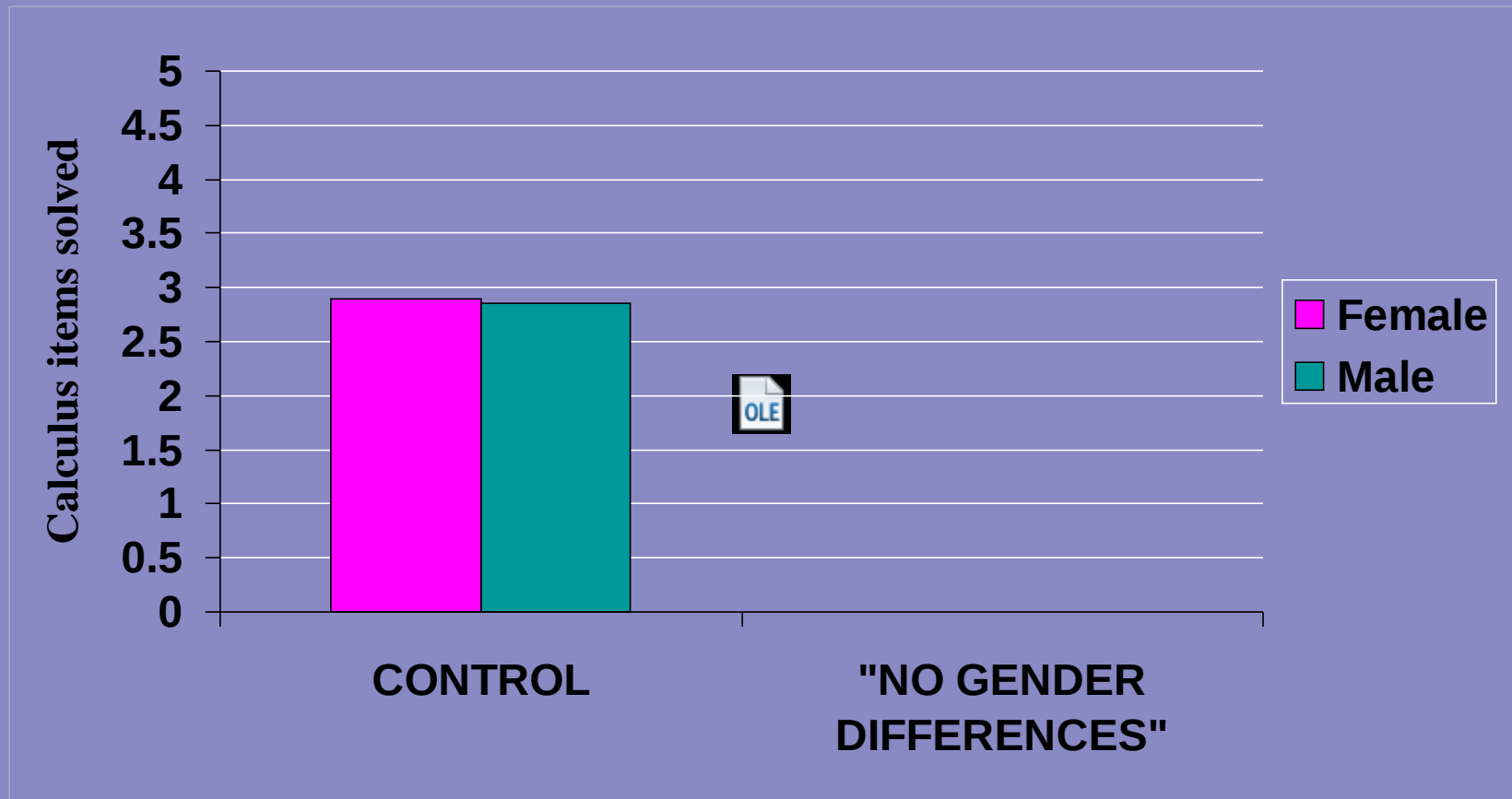


Field Experiment: Women in the Science Pipeline

Highest Level Calculus Students

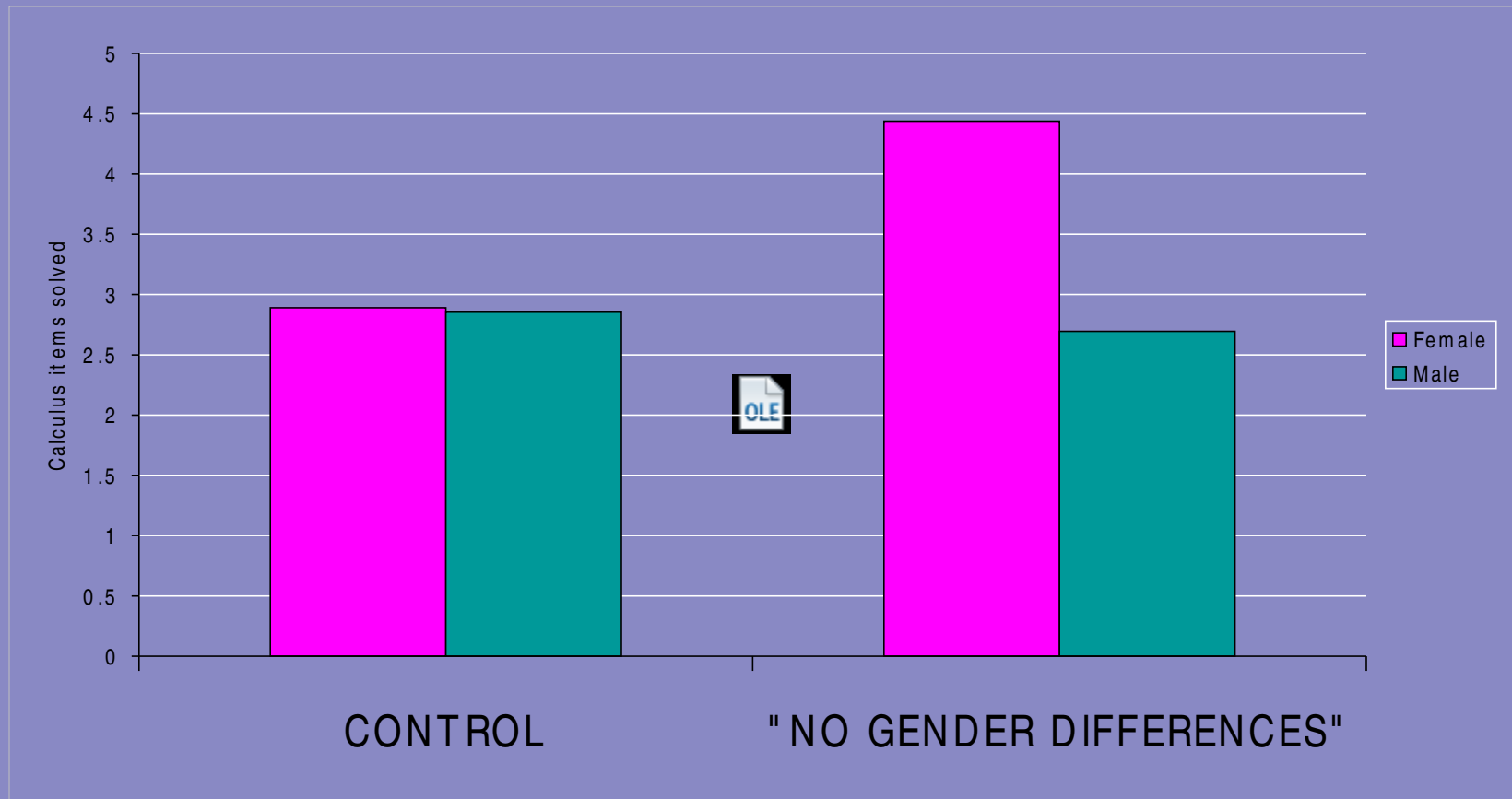
Field Study: Women in the Science Pipeline

Highest Level College Calculus Students



Field Study: Women in the Science Pipeline

Advanced Level Women Outperform Advanced Men
in Calculus When Threat Reduced



From Vulnerability to Less Ability

"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

Experiment

Alter, Aronson, et al (2009)

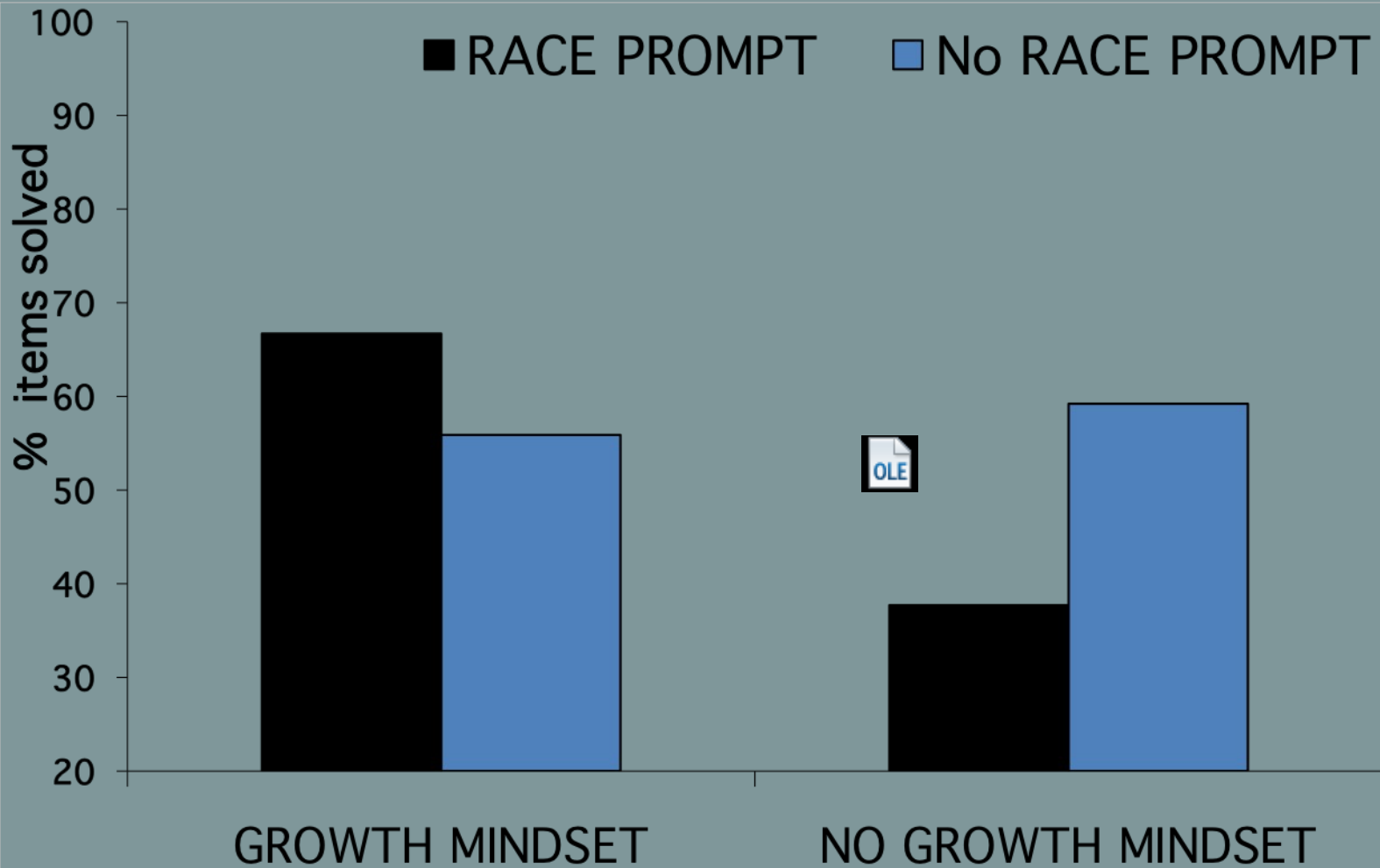
Question:

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



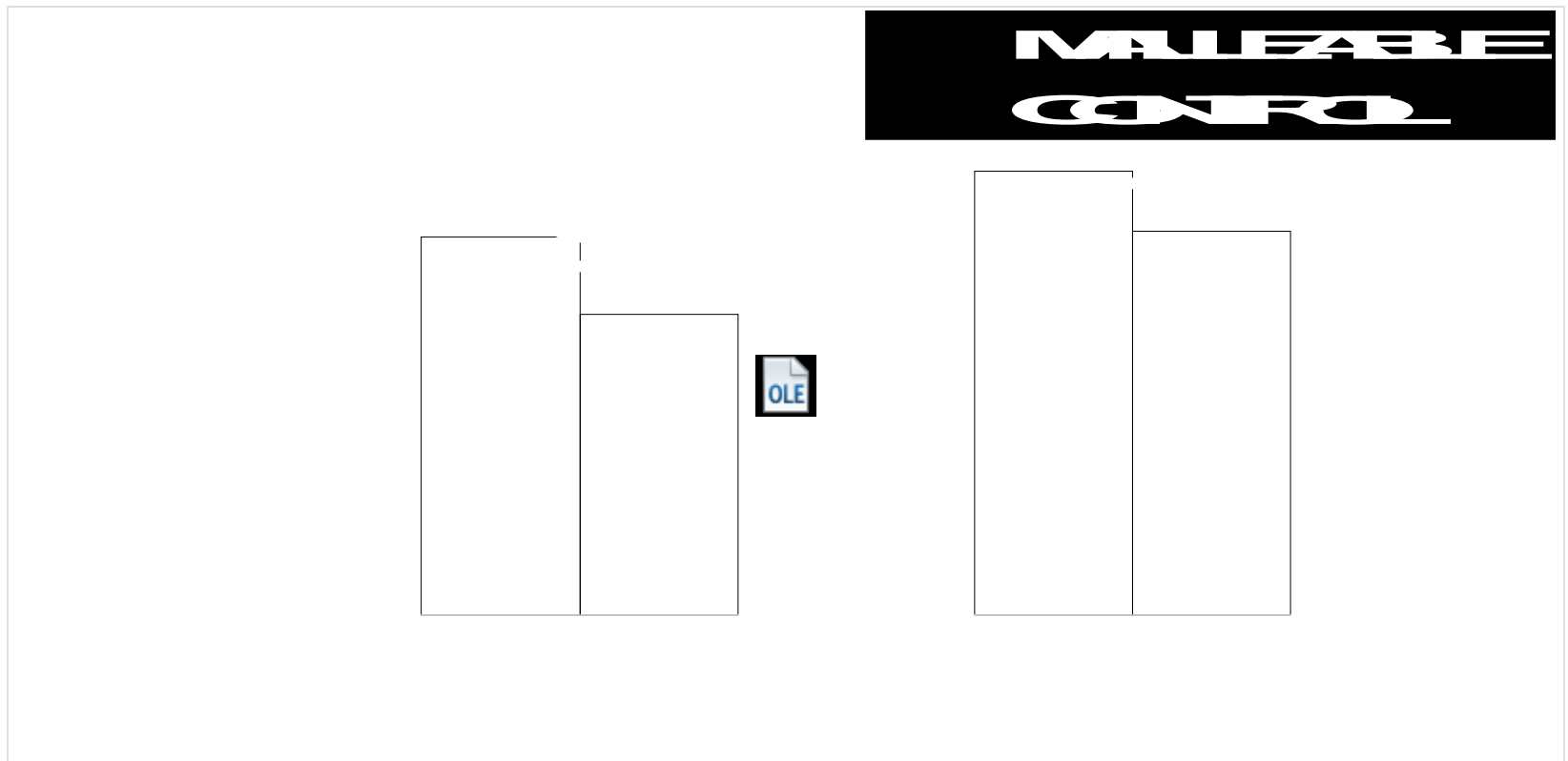
Reducing the effects of Stereotype Threat In the real world: Shaping implicit theories

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

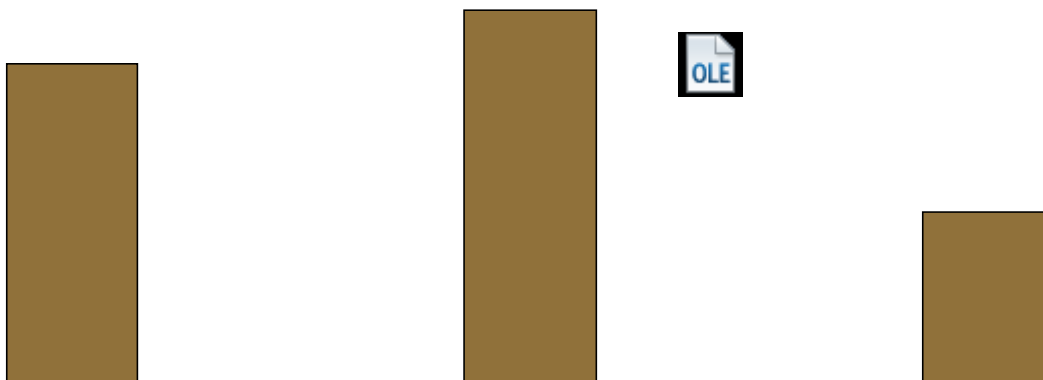


Reducing Stereotype Threat in Middle School: A field Intervention

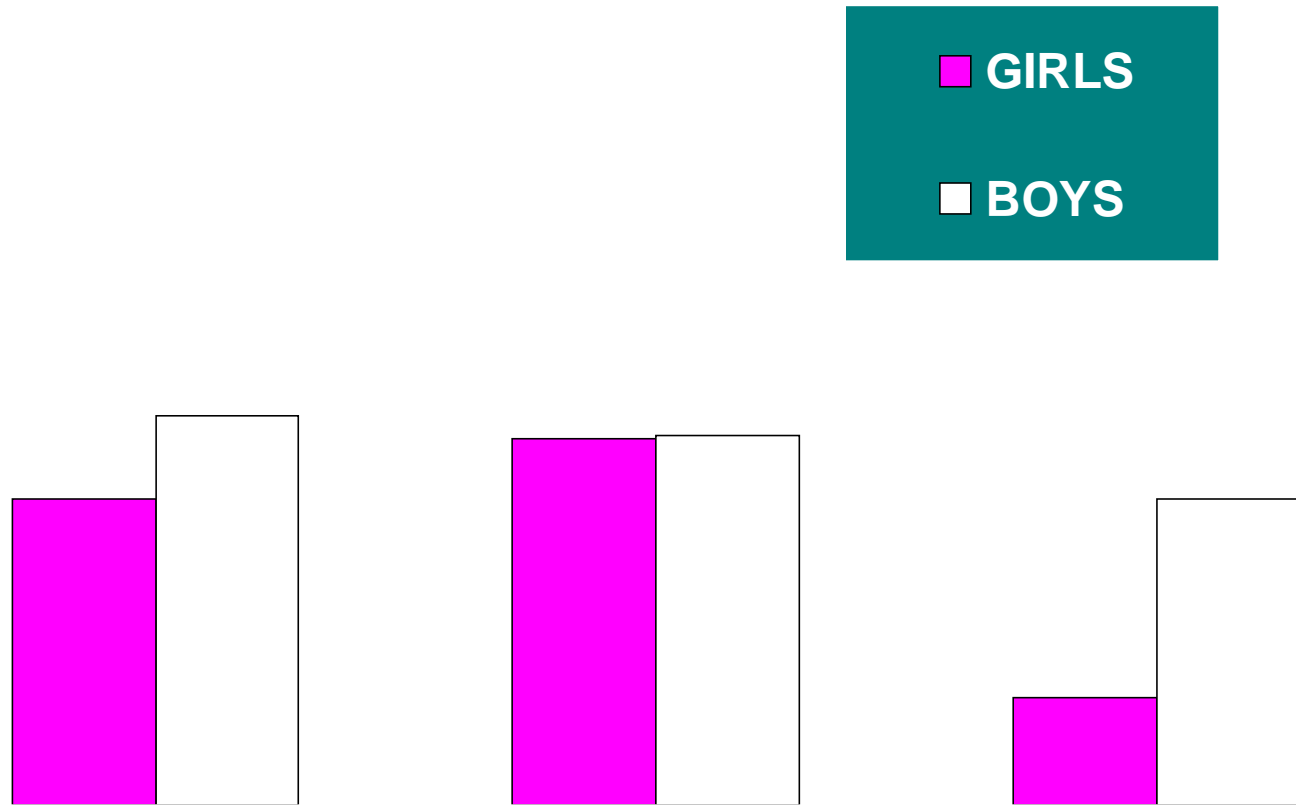
Question: Can psychological intervention raise test scores of minority students?

- 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

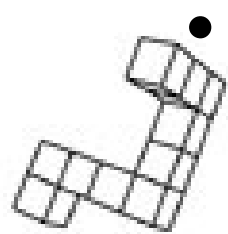


Identity Salience

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?

Vandenberg Mental Rotation Task



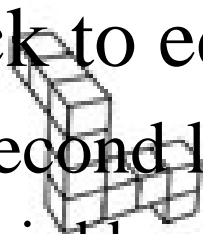
- Click to edit Master text styles

- Second level

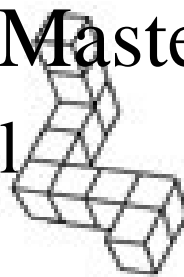
- Third level

- Fourth level

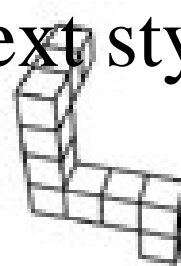
- Fifth level



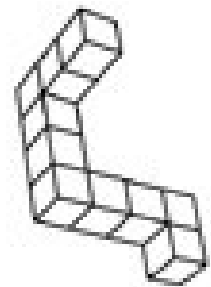
A



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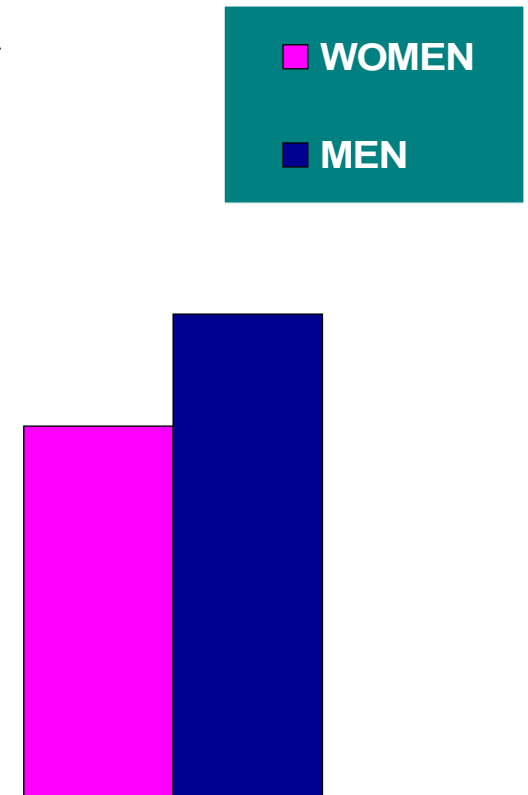


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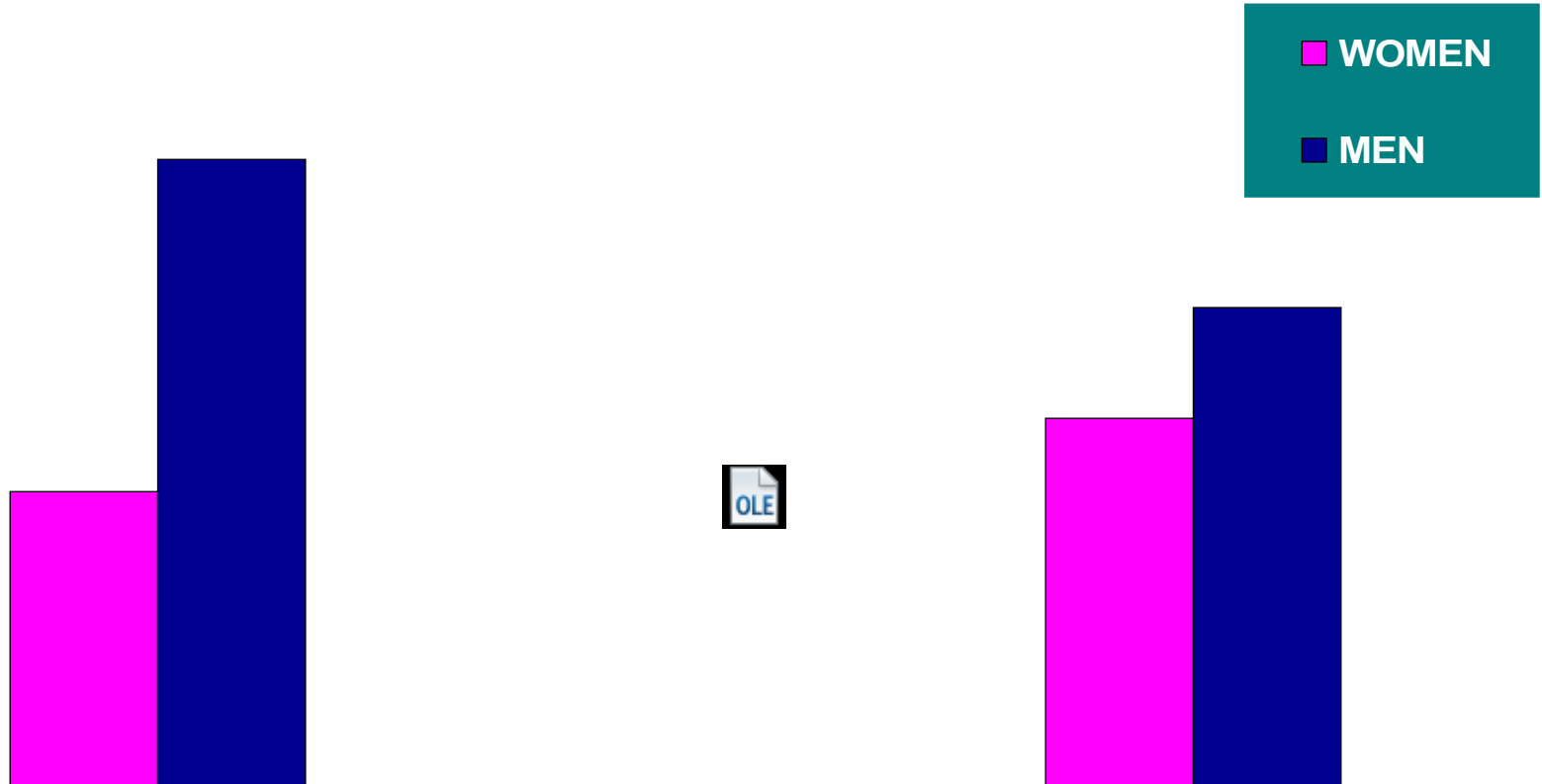


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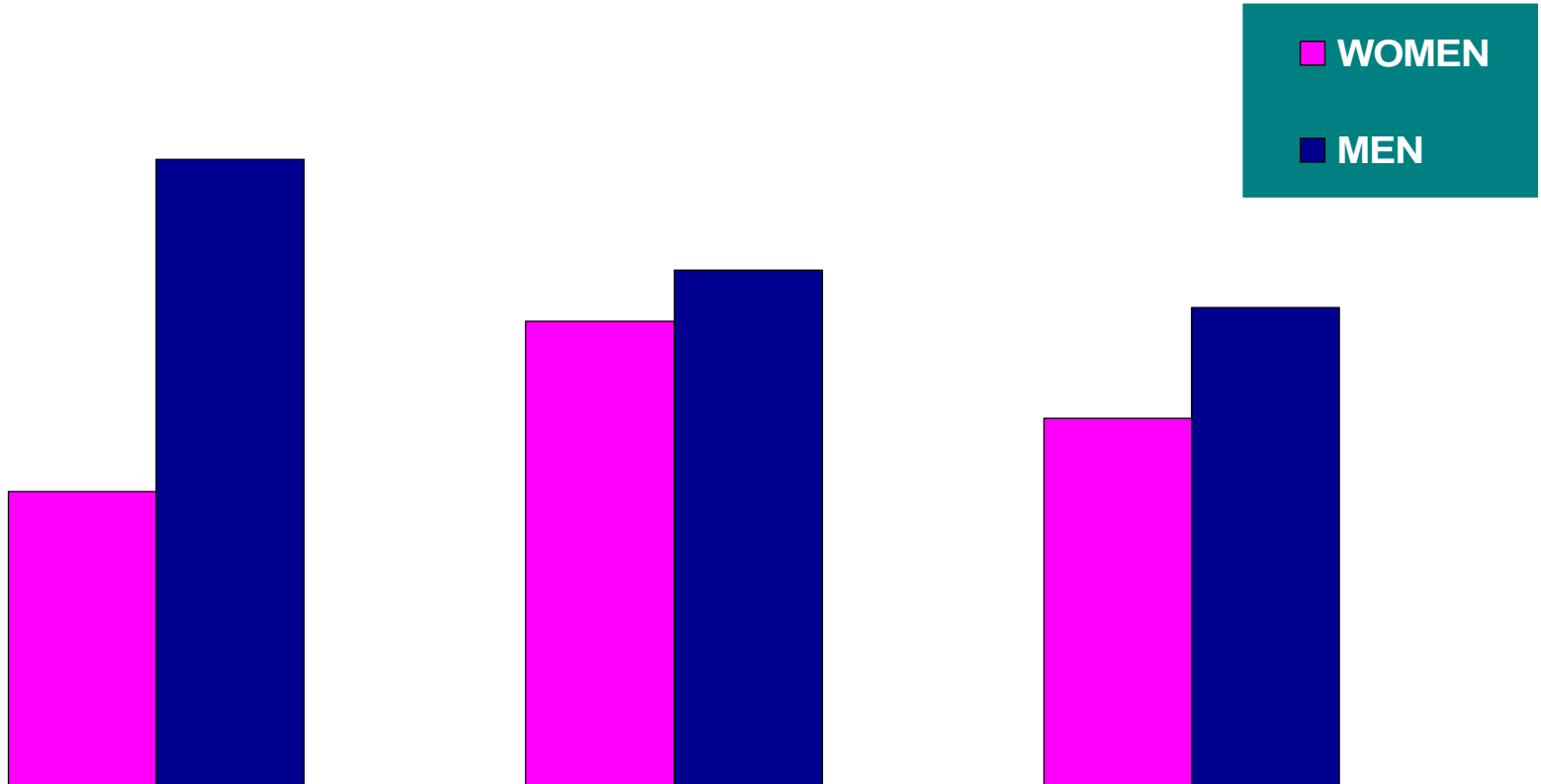
Identity Salience Influences Women's Mental Rotation Performance



Identity Salience Influences Women's Mental Rotation Performance



Identity Salience Influences Mental Rotation Performance



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”

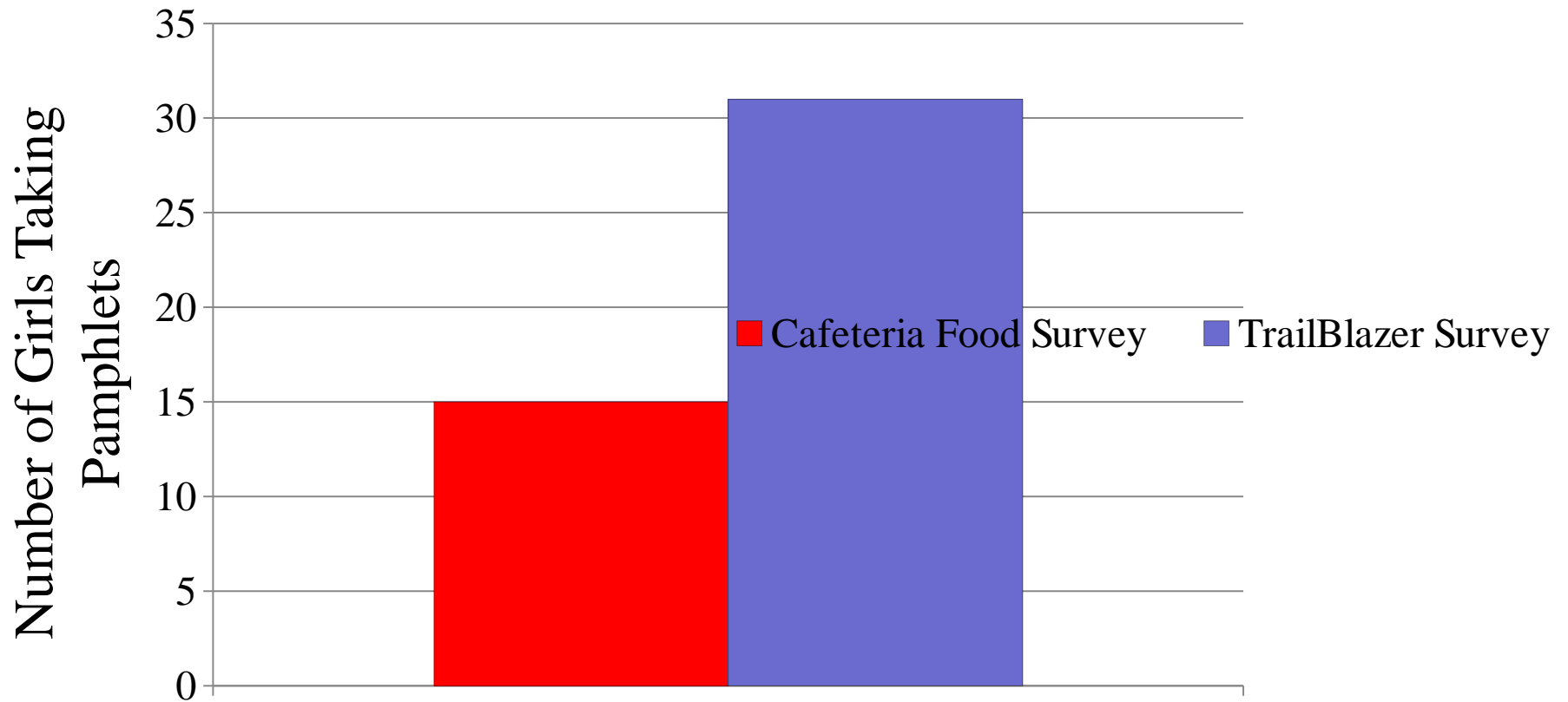
DV: How many students requested information pamphlets about STEM majors?

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

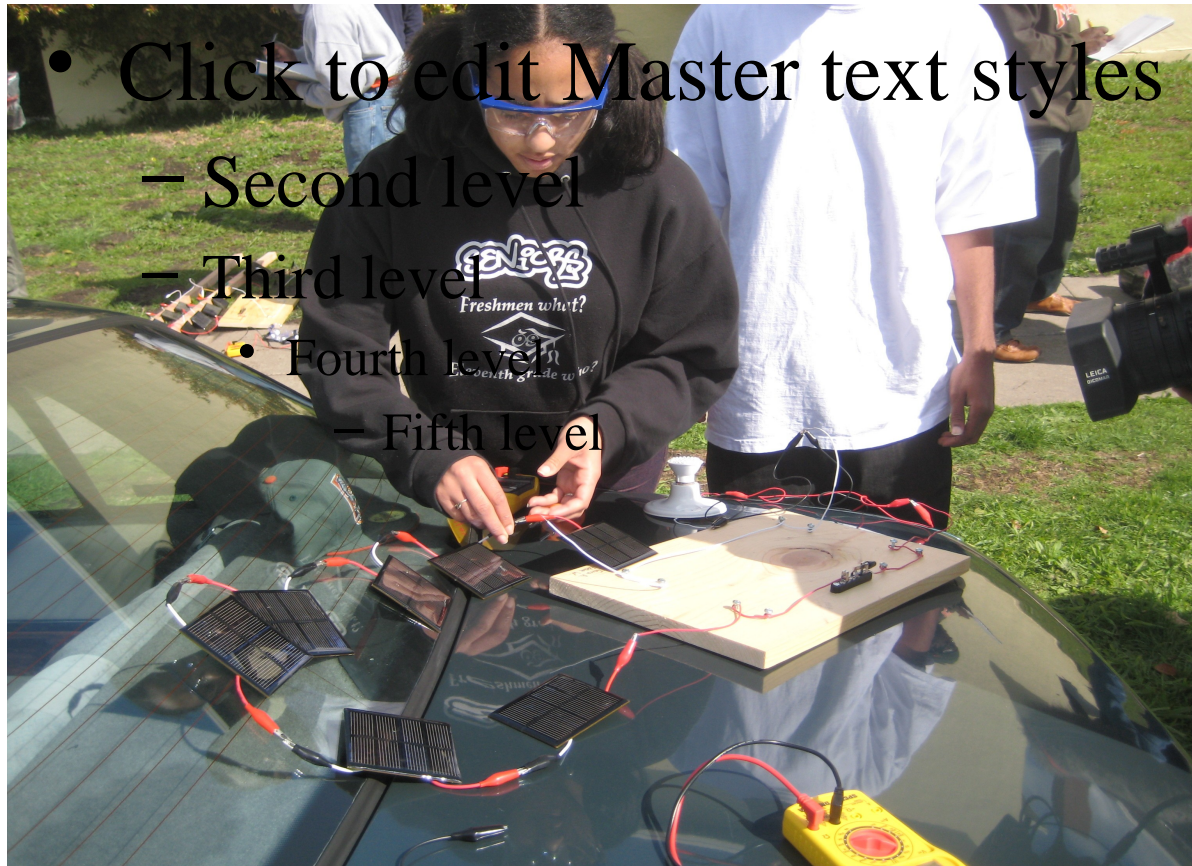
Identity Salience In School

- 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

Solar Students



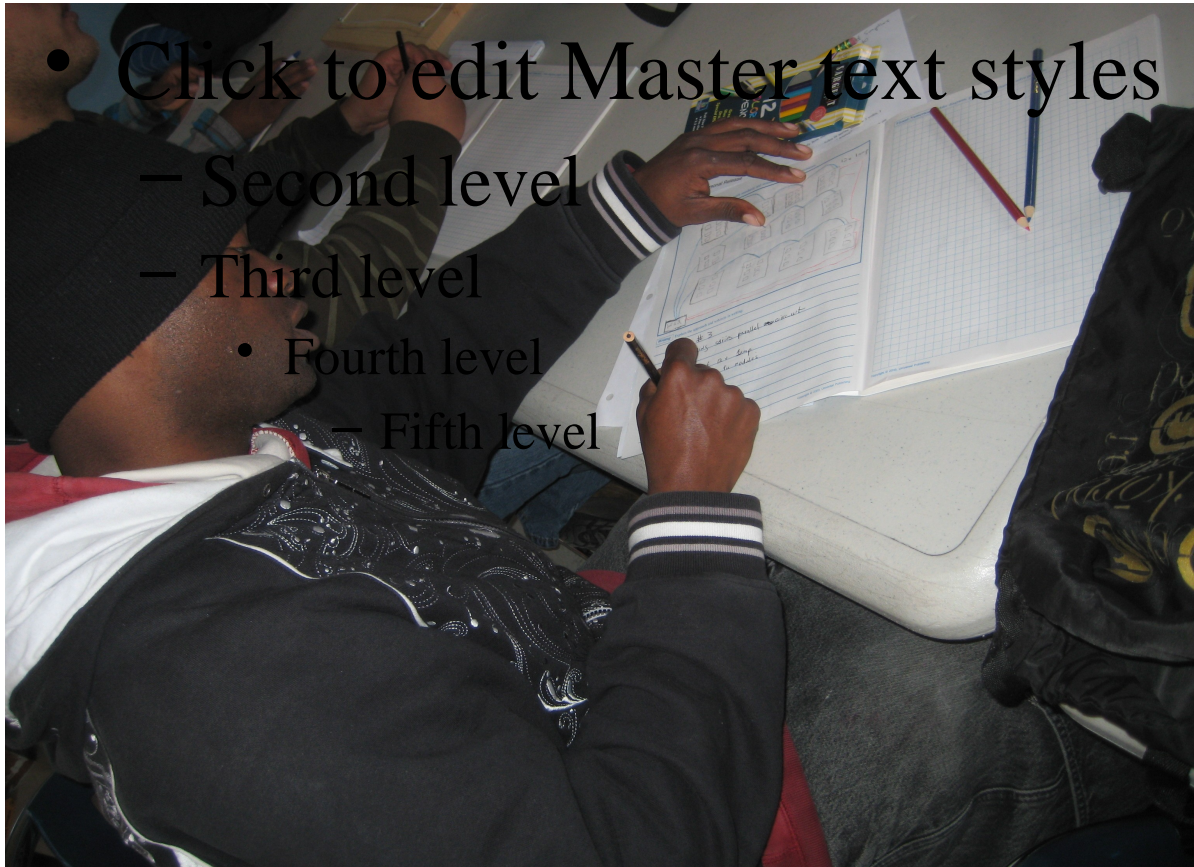
Solar Students

- Click to edit Master text styles
 - Second level
 - Third level
 - Fourth level
 - Fifth level



Solar Students

- Click to edit Master text styles
 - Second level
 - Third level
 - Fourth level
 - Fifth level



Solar Students



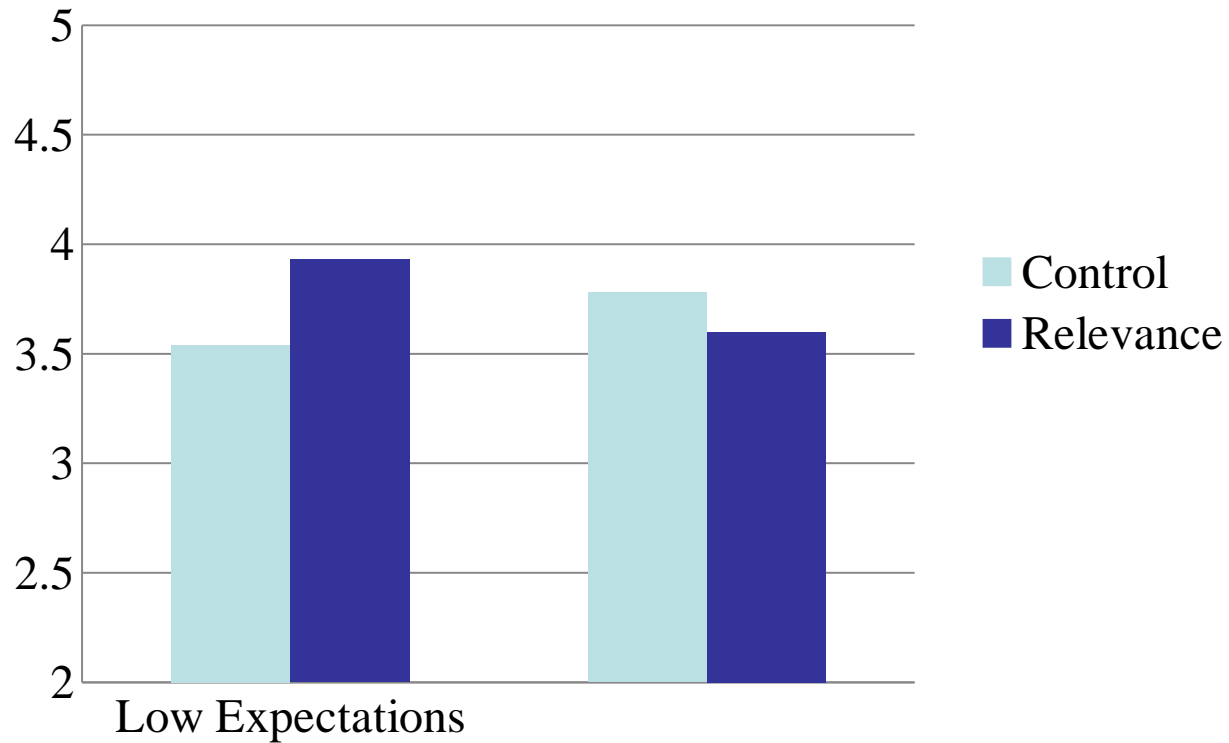
Solar Students



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.

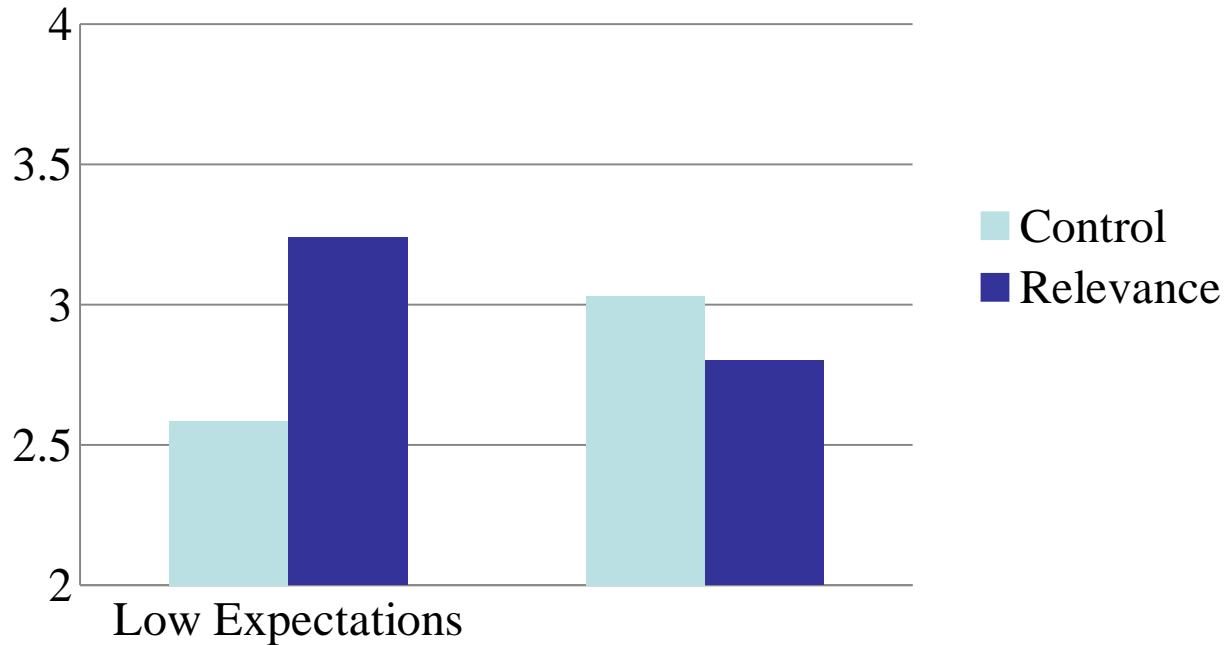
Science Interest



Source: Hulleman, C. S. & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science*, 326, 1410-1412. doi: 10.1126/science.1177067

Personal Relevance and Performance

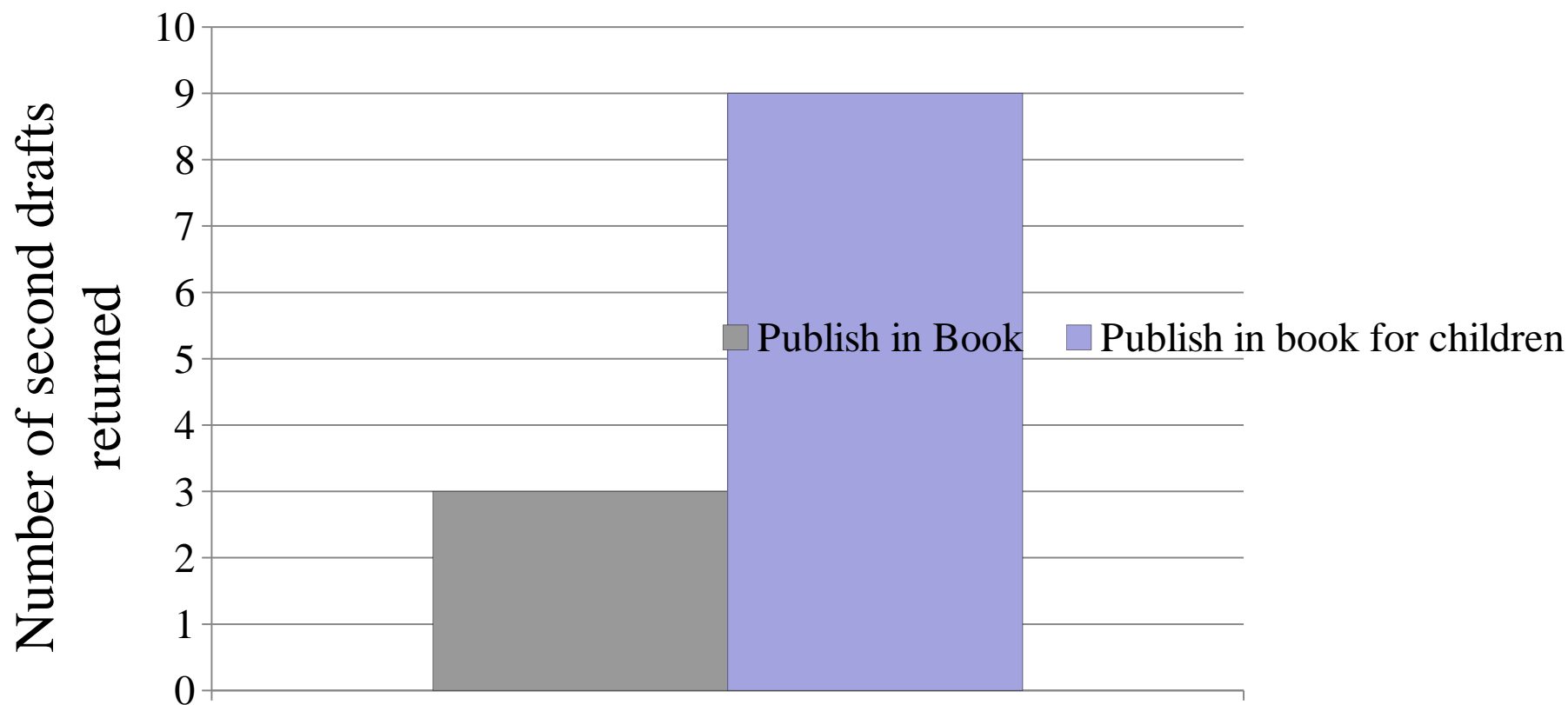
Course Grades



Source: Hulleman, C. S. & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science*, 326, 1410-1412. doi: 10.1126/science.1177067

Changing Meaning to Maintain Motivation in the Face of Threat

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



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

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