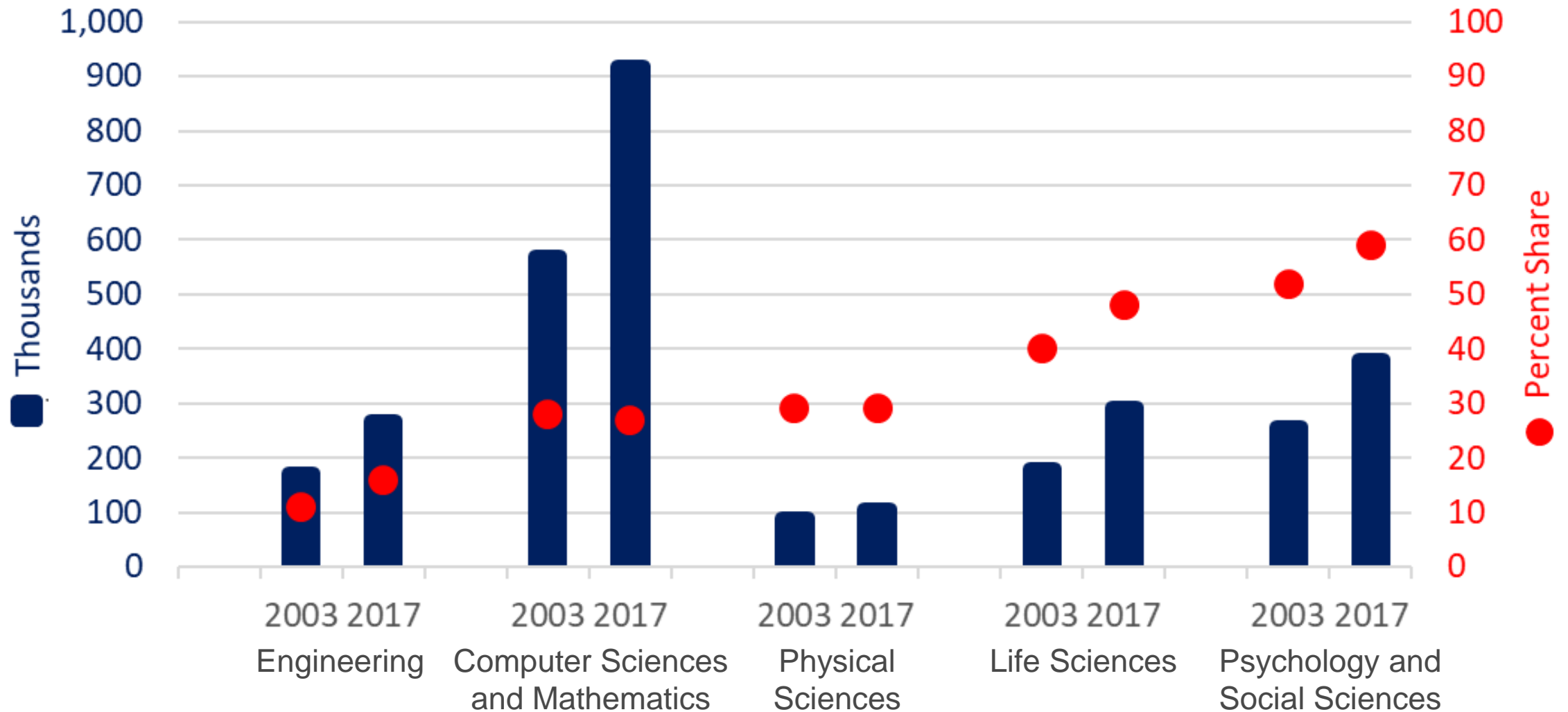# Breaking Down Barriers to Diversity and Inclusion in STEM

## 2 March 2021

Sylvie DeLaHunt
Future Weapon Concepts and Algorithms Section Supervisor
Air and Missile Defense Sector, APL

Kerri Phillips, Ph.D.
Program Manager for Hypersonic Weapons
Force Projection Sector, APL

# Women in Science and Engineering Occupations

# The Current Reality

- From at a young age, women receive frequent, yet often subtle, external and internal messaging that they do not belong in STEM

- **Gender stereotypes** continue to lead to:
  1. **Biases** toward who can succeed in STEM
  2. The existence of **social phenomena** that hinder women's self-efficacy in STEM

- Negative messaging and social phenomena then affect how women **perceive and respond to institutional obstacles** throughout their STEM education and careers
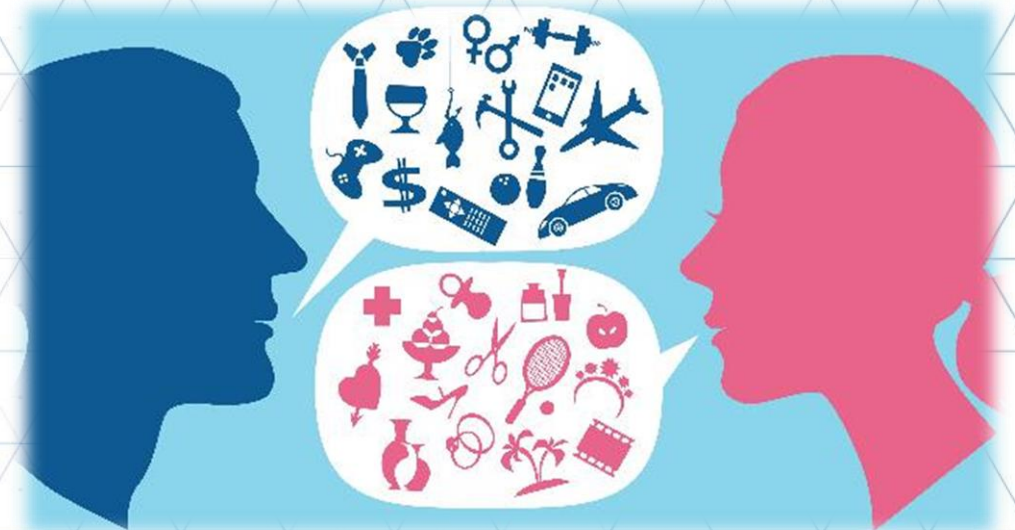
Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Gender Stereotypes and Biases

**Gender Norms**

**Stereotype Example: Draw a Scientist**

**Growth vs. Fixed Mindsets**
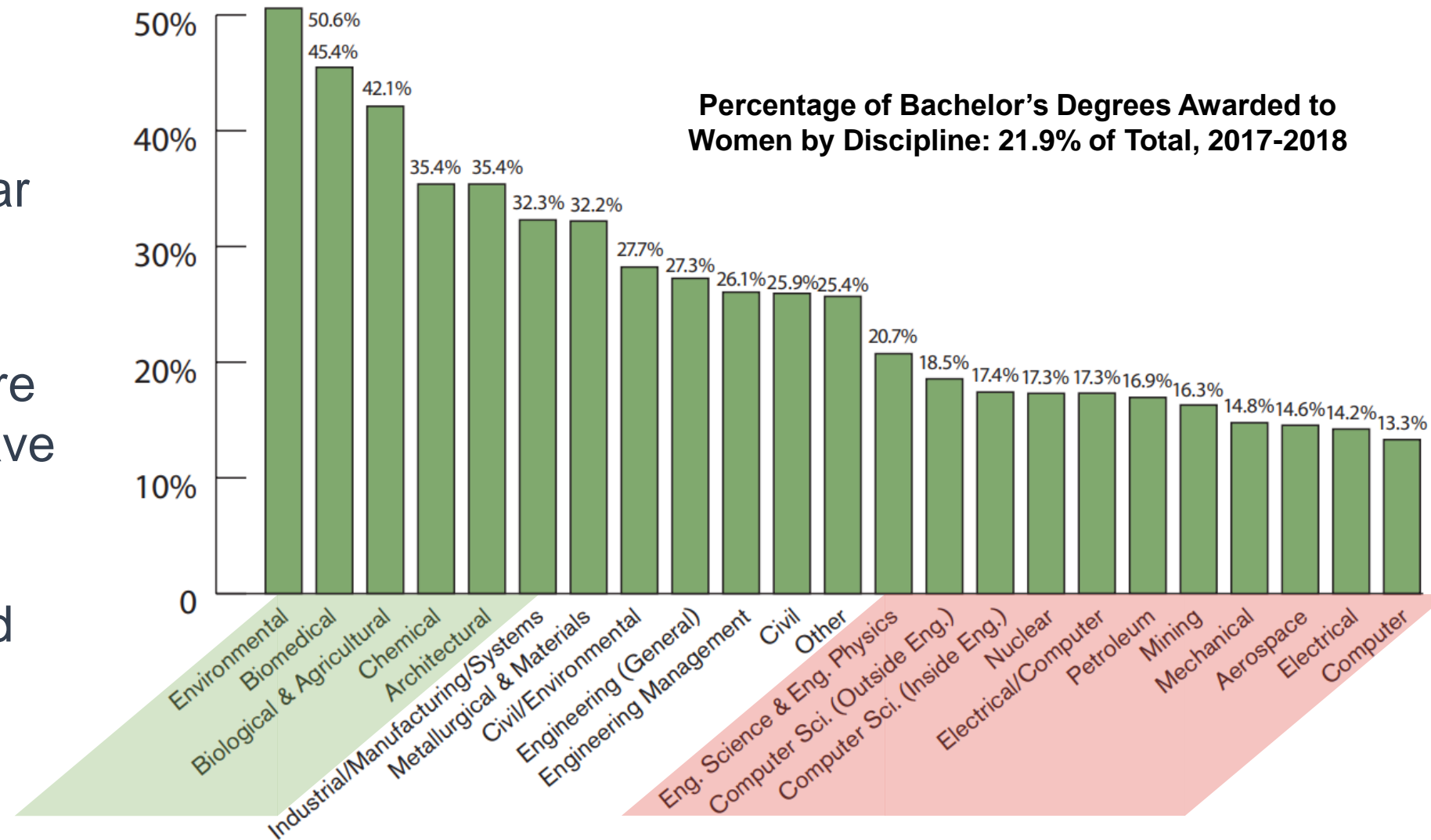
**Explicit and Implicit Bias**

# Gender Norms

- Gender norms are ***social expectations*** of acceptable or desirable "feminine" or "masculine" behaviors

- For example, women are expected to be more altruistic than men – more helpful, nurturing, and socially-oriented – rather than competitive or achievement-oriented

- Gender norms influence career choices
  - Teaching, nursing, and social work are examples of female-dominated fields
  - Even within engineering, women favor disciplines with clear ***social benefits***
  - Men are more likely to have experience with ***computing***, ***electronics***, and ***power tools***

References:
- B. Cislaghi, L. Heise, "Gender norms and social norms: differences, similarities and why they matter in prevention science," Sociology of Health & Illness, 42(2): 407–422. February 2020.
- M. Heilman and J. Chen, "Same Behavior, Different Consequences: Reactions to Men's and Women's Altruistic Citizenship Behavior," Journal of Applied Psychology, 90 (3), pp. 431–441, 2005.
- R. Premack, "43 jobs that are dominated by women," Business Insider, 2018, https://www.businessinsider.com/teacher-nurse-salary-jobs-for-women-2018-6.

# Gender Norms Influence Career Choices

- Women favor engineering careers with clear *social benefits*

- Male students are more likely to have experience with *computing*, *electronics*, and *power tools*

**Percentage of Bachelor's Degrees Awarded to Women by Discipline: 21.9% of Total, 2017-2018**



Bar chart — Percentage of Bachelor's Degrees Awarded to Women by Discipline:
- Environmental: 50.6%
- Biomedical: 45.4%
- Biological & Agricultural: 42.1%
- Chemical: 35.4%
- Architectural: 35.4%
- Industrial/Manufacturing/Systems: 32.3%
- Metallurgical & Materials: 32.2%
- Civil/Environmental: 27.7%
- Engineering (General): 27.3%
- Engineering Management: 26.1%
- Civil: 25.9%
- Other: 25.4%
- Eng. Science & Eng. Physics: 20.7%
- Computer Sci. (Outside Eng.): 18.5%
- Computer Sci. (Inside Eng.): 17.4%
- Nuclear: 17.3%
- Electrical/Computer: 17.3%
- Petroleum: 16.9%
- Mining: 16.3%
- Mechanical: 14.8%
- Aerospace: 14.6%
- Electrical: 14.2%
- Computer: 13.3%

References:
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- J. Roy, "Engineering by the Numbers," ASEE, 2018

# Draw a Scientist

- From 1966-1977, **only 0.6%** of students depicted a female scientist

**Percentage of students drawing female scientists**

| Study Year | 1966-1977 | 1985 | 2016 |
|---|---|---|---|
| Girls | 1.2% | 33% | 58% |
| Boys | 0% | 2.4% | 13% |

- Drawing a female scientist is becoming **more common**, especially for girls; however, students are less likely to draw female scientists as they get older
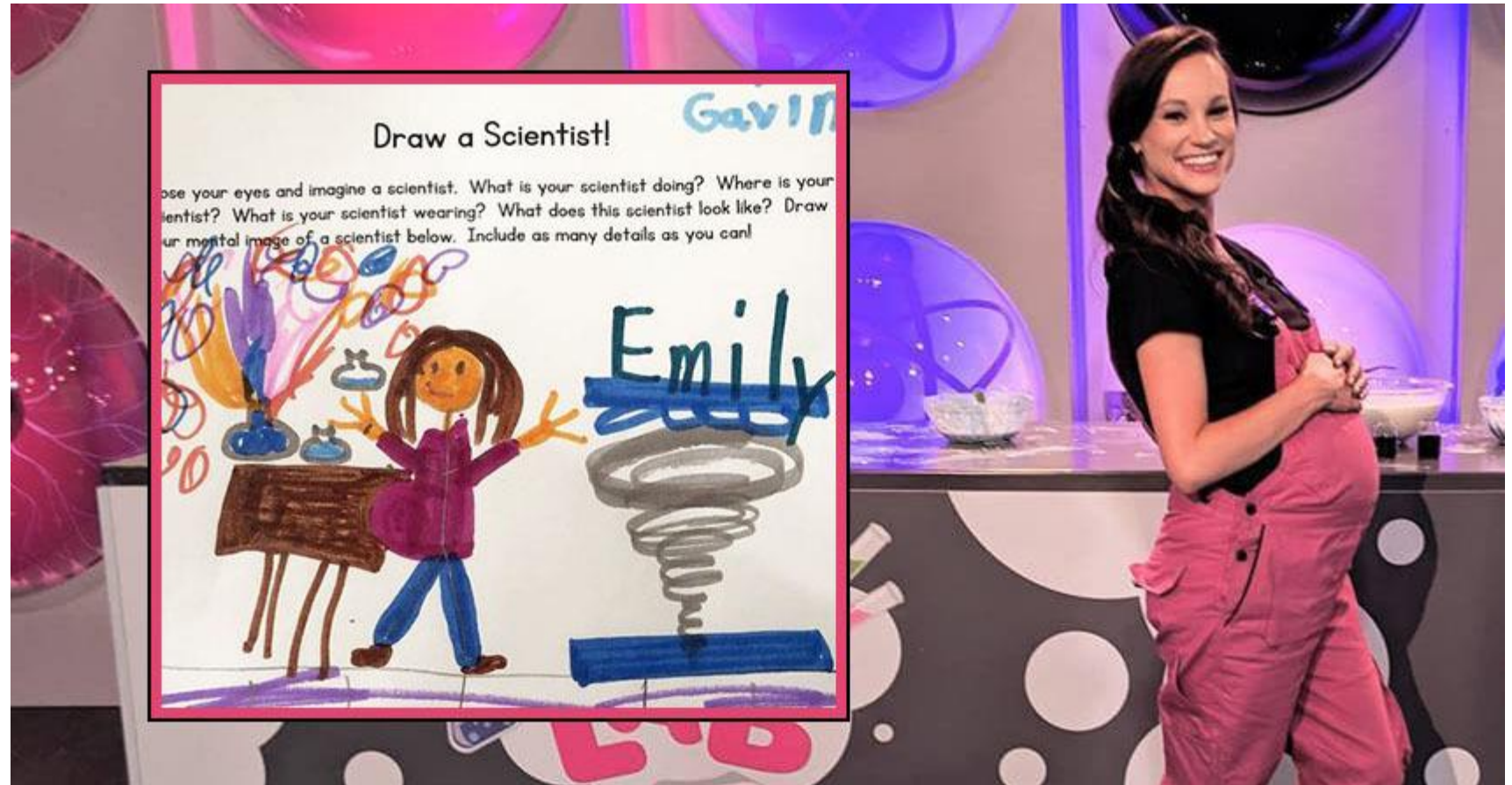
**Percentage of students who draw a male scientist**
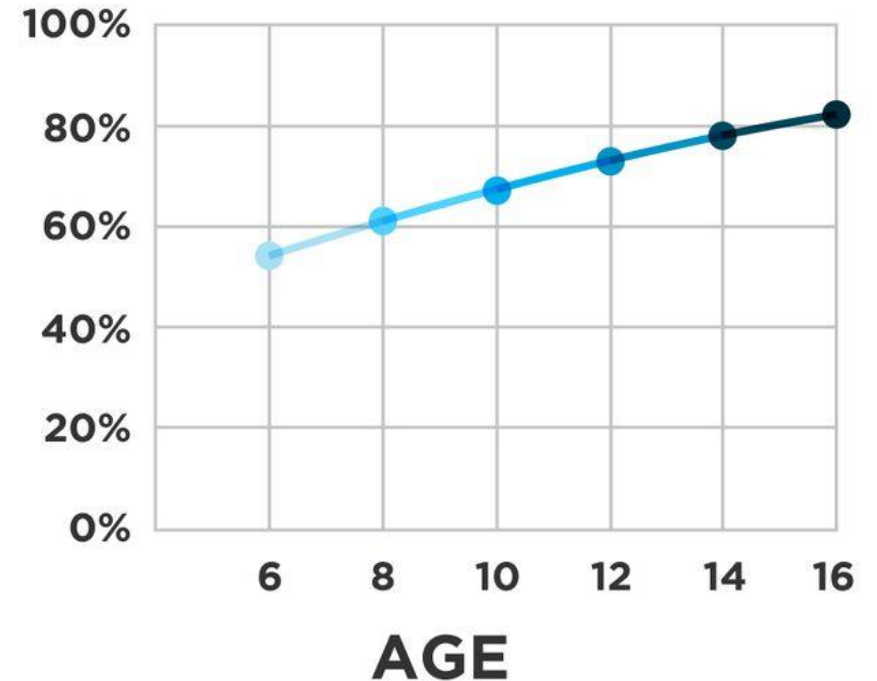


Both boys and girls are more likely to draw a male scientist as they get older.

source: Miller, Nolla, Eagly, & Uttal, 2018

Reference: D. I. Miller, K.M. Nolla, A.H. Eagly, D.H. Uttal, "Development of Children's Gender-Science Stereotypes: A Meta-analysis of 5 Decades of U.S. Draw-A-Scientist Studies," Child Development, Vol 89, Issue 6, 20 March 2018.

# Gender Stereotypes: Draw a Scientist

Reference: *Emily's Wonder Lab*, Netflix, https://www.netflix.com/title/81128389
Image: https://www.scarymommy.com/emilys-wonder-lab-fan-draw-a-scientist/

# Combat Gender Stereotypes

- **Everyone should:**
  - Treat kids equally and encourage interest in STEM fields
    - Encourage all kids to play with toys involving **construction and manipulation** skills
  - Remove gender stereotypes from advertising and feature diverse examples of successful STEM professionals
  - Highlight **real-life applications** and **social benefits** of all STEM fields in outreach

- **Universities should:**
  - Offer introductory courses in coding, electronics, woodshop, and spatial visualization

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Growth vs. Fixed Mindsets

- Young *girls* are praised for *intelligence*, causing fixed mindsets
  - Skills and intelligence are innate and finite

- Young *boys* are praised for *effort*, promoting growth mindsets
  - New skills can be developed through effort and learning

- Those with growth mindsets more likely to:
  - Embrace challenges and *risk taking*
  - See effort as a path to mastery
  - *Learn from failure* and criticism
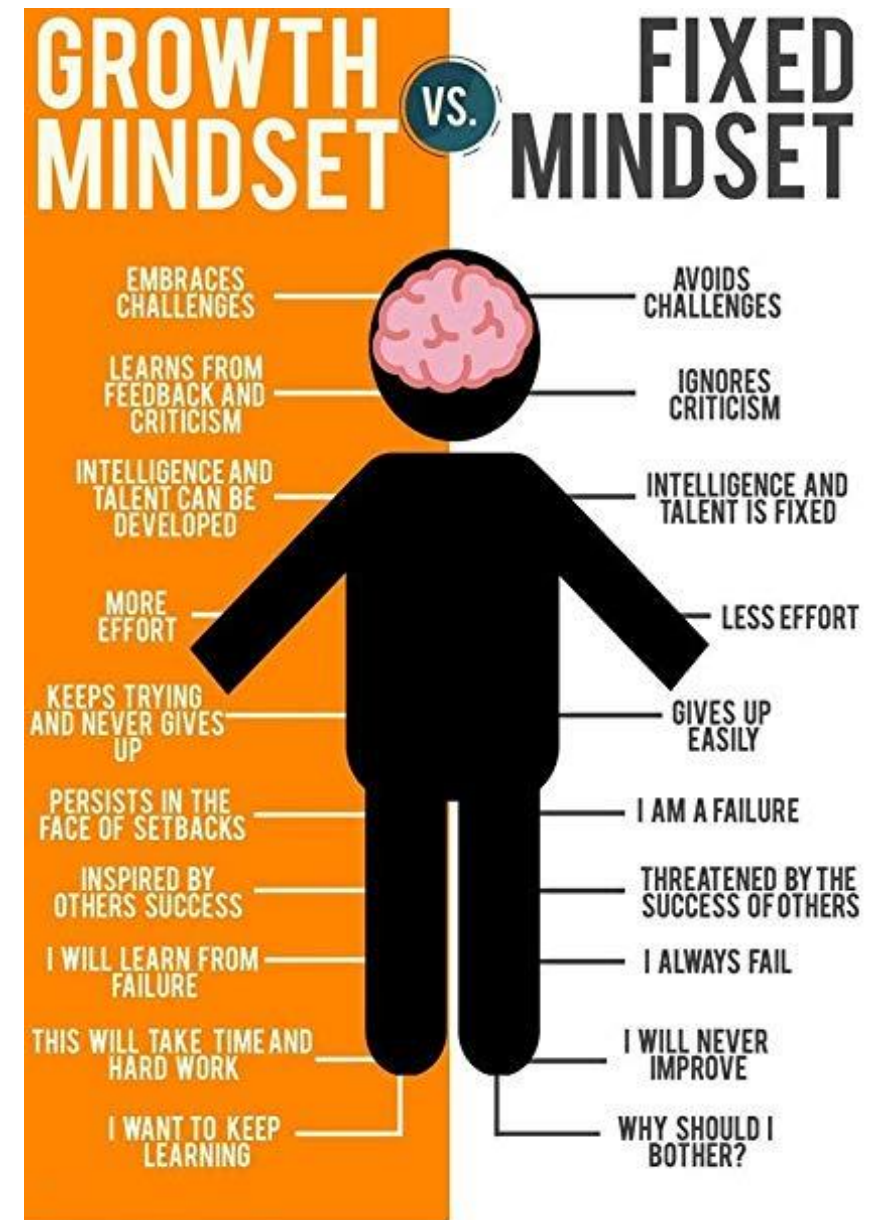
References:
- C. Dweck, "What Having a 'Growth Mindset' Actually Means," Harvard Business Review, 2016,
- H.G. Halvorson, "The Trouble With Bright Girls," Psychology Today, https://www.psychologytoday.com/blog/the-science-success/201101/the-trouble-bright-girls
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

Image: https://www.amazon.com/Faverlkujj-Growth-Mindset-Artwork-Decorations/dp/B07J3C3ZB7

# Cultivate Growth Mindsets

- **Parents and teachers should:**
  - Reiterate that skills can be *acquired*
  - *Praise* all students for *effort, learning, and progress*
    - Encourage seeking help, soliciting feedback, and testing new approaches

- **Everyone should:**
  - *Highlight the struggle* – setbacks are valuable learning experiences

References:
- C. Dweck, "What Having a 'Growth Mindset' Actually Means," Harvard Business Review, 2016,
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
Image: https://www.mindsetworks.com/science/

# Explicit Bias

- Biases influence how we evaluate, perceive, and behave toward others

- Explicit biases are "consciously held, self-reported attitudes"

*"Efforts to 'balance' gender and race **diminish the overall quality of an organization** by reducing the collective merit of the personnel"*

*"I frequently hear concern… that recently hired women or minorities [are] only filling the **'diversity slot'**"*

*"This new manager told me directly that I would not 'want' a promotion because… **I am a mom so I wouldn't want to travel**"*

*"Let me tell you about my trouble with girls. Three things happen when they are in the lab: **You fall in love with them**, **they fall in love with you**, and **when you criticize them they cry**."* – Nobel Laureate Tim Hunt (2015)
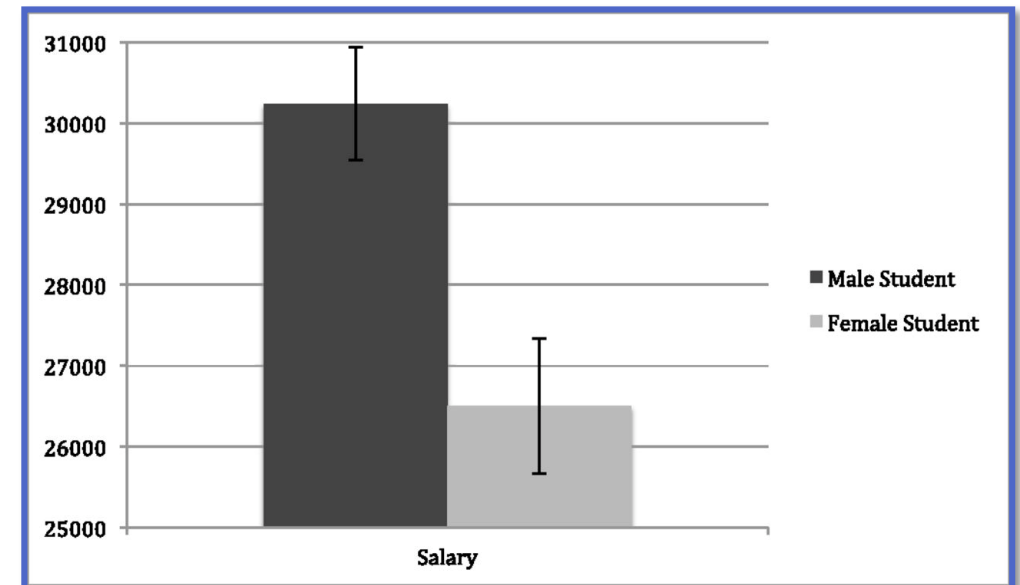
Reference:
- J. Handelsman and N. Sakraney, "Implicit Bias," White House Office of Science and Technology Policy, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/bias_9-14-15_final.pdf
- J. C. Williams, S. Li, R. Rincon, and P. Finn. "Climate Control: Gender and Racial Bias in Engineering?" Center for Worklife Law & Society of Women Engineers, 2016.

# Implicit Bias

- Implicit biases are unconscious, unintentional assumptions

- Science faculty received ***identical*** application packages for either a male or a female applicant

- Both male and female faculty assessed the ***male*** applicant to be:
  - ***More competent***
  - More hireable
  - A more desirable mentee
  - Deserving of a ***higher salary***
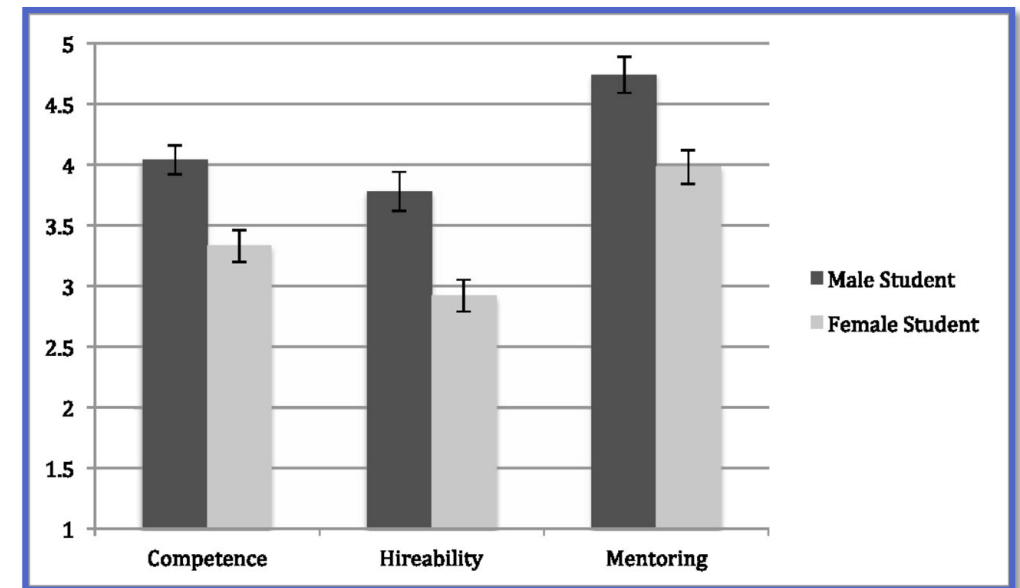


**Means for ratings of student competence, hireability, and faculty interest in mentoring**



**Means for salary conferral**

Reference: C.A. Moss-Racusin, *et al.*, "Science Faculty's Subtle Gender Biases Favor Male Students," PNAS, 2012.

# Implicit Bias and Gender Norms

Women with ambiguous performance were rated as ***equally likeable***, but ***less competent***
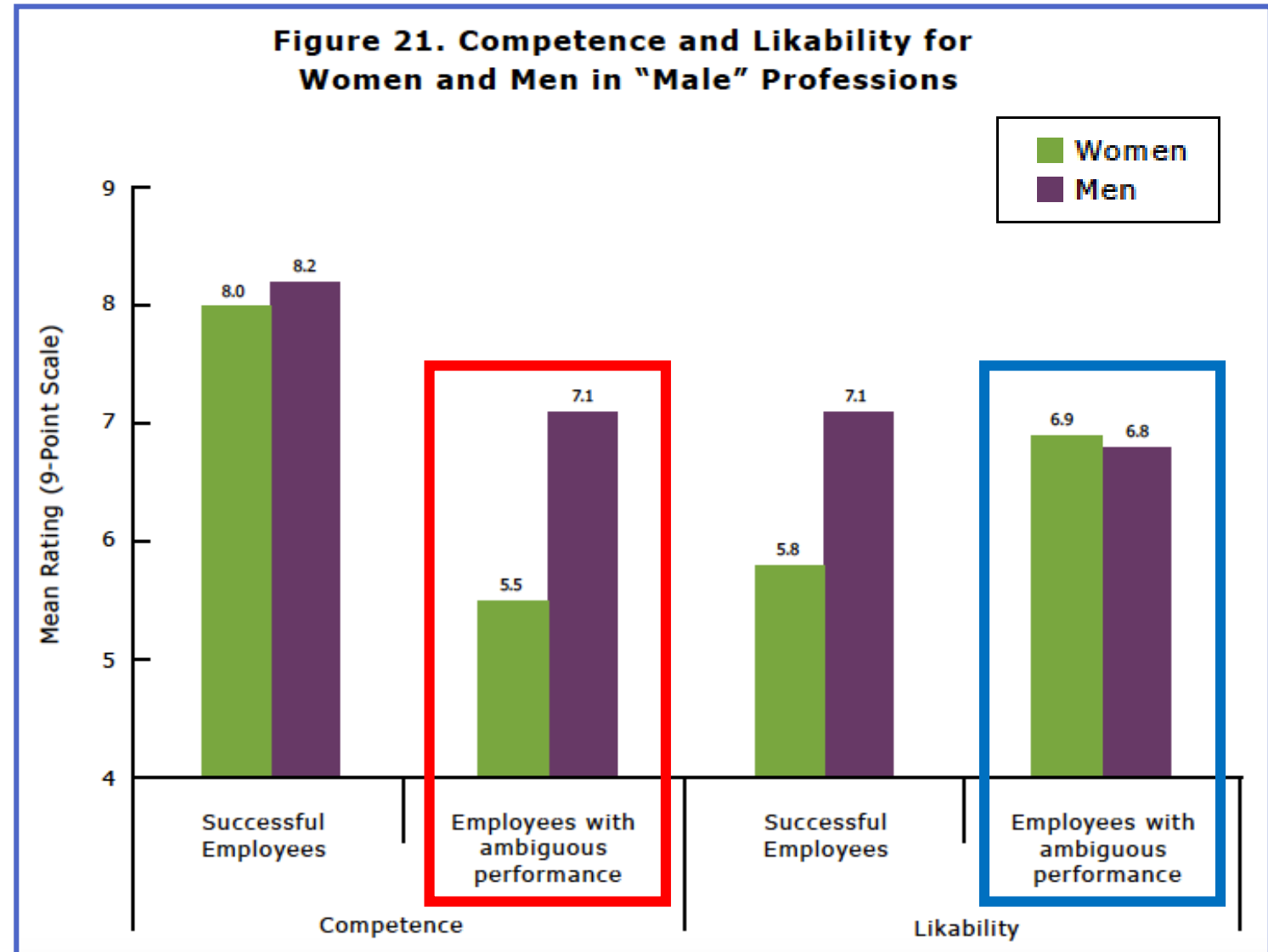


Figure 21. Competence and Likability for Women and Men in "Male" Professions

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Implicit Bias and Gender Norms

Successful women were rated as **equally competent**, but **less likeable**
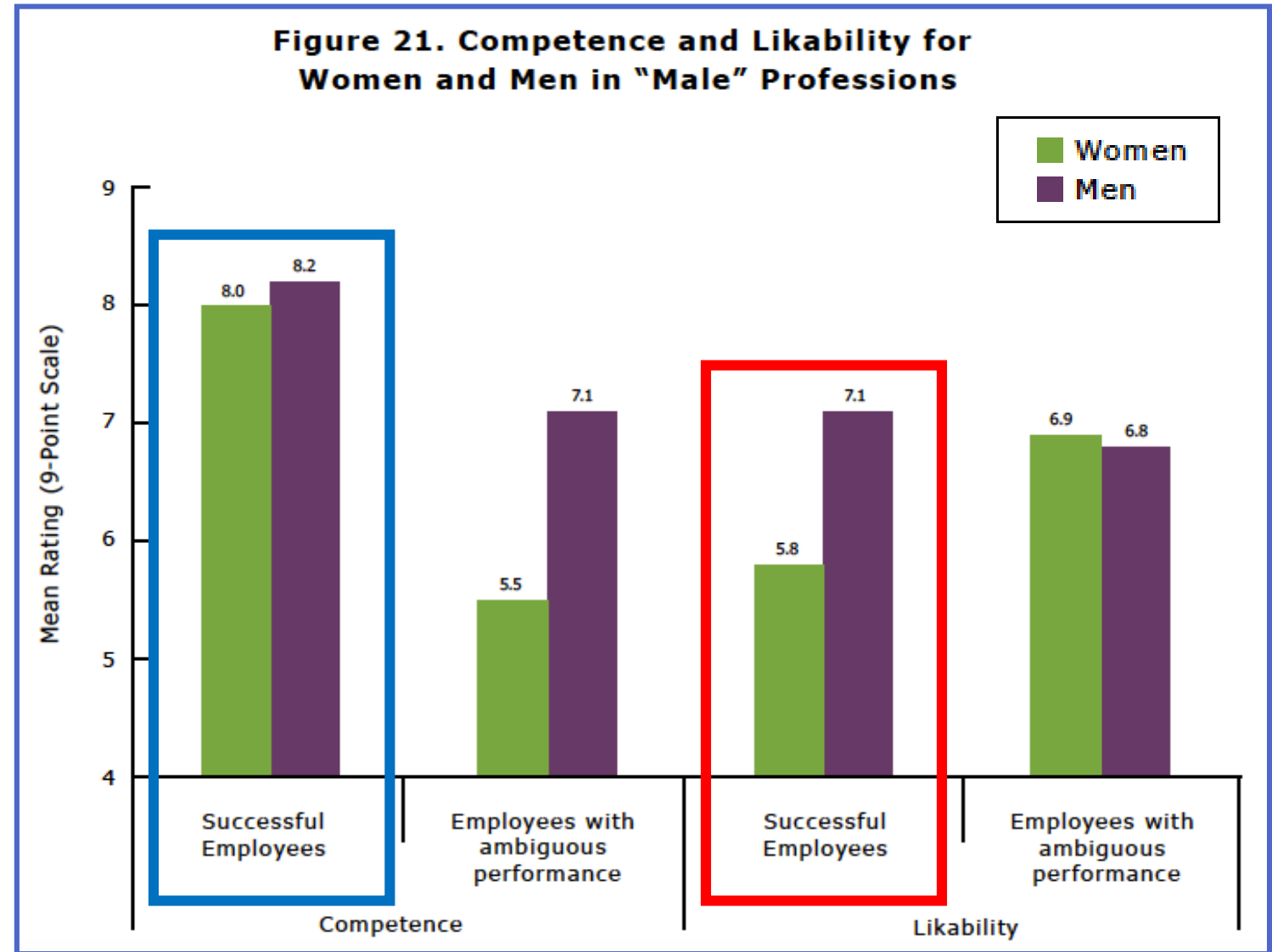


Figure 21. Competence and Likability for Women and Men in "Male" Professions

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Counter Implicit Biases and Be an Ally

- **Everyone should:**
  - *Raise awareness* about biases working against women in STEM
    - Take an implicit bias test (e.g., from Harvard's Project Implicit)
    - Host and participate in *implicit bias training*
  - Become a trained ally through *bystander intervention training*

- **Universities and employers should:**
  - Create *clear and objective* interview and performance evaluation criteria
    - Conduct panel interviews with diverse panelists
    - Remove names and indications of gender when reviewing resumes
    - In letters of recommendation, highlight *ability and success* using specific examples

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Social Phenomena

**Stereotype Threat**

**Imposter Syndrome**

**Tiara Syndrome**



Image: http://languages.oberlin.edu/blogs/ctie/2016/02/28/the-stereotype-threat/
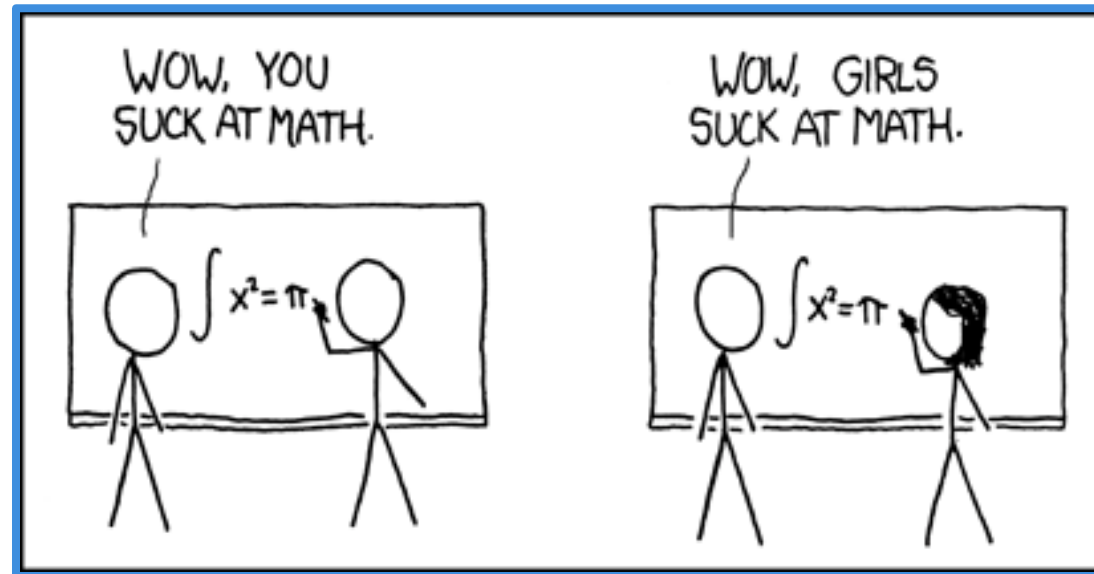
# Stereotype Threat

- Refers to being at ***risk of confirming***, as a self-characteristic, a ***negative stereotype*** about one's social group

- ***Women in STEM*** are at risk of conforming to the ***stereotype*** that women are worse at math and science
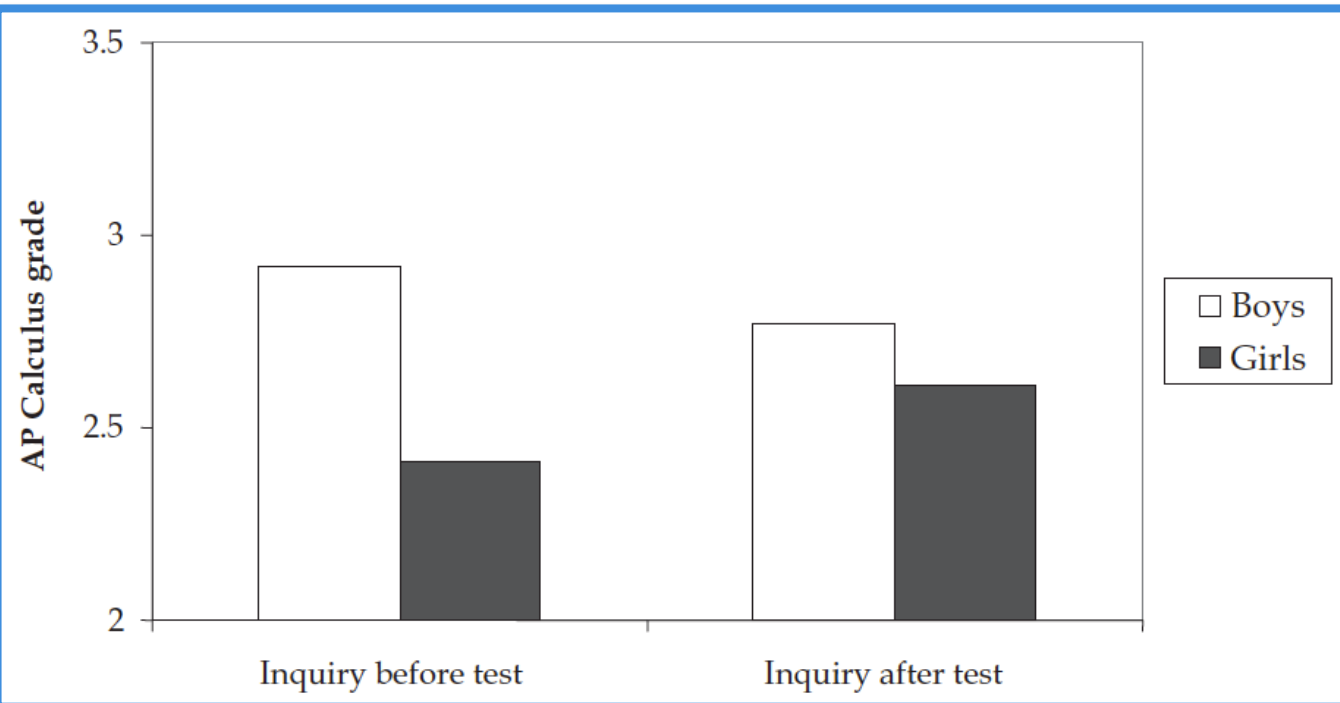
Reference: C.M. Steele and J. Aronson, (1995). Stereotype threat and the intellectual test performance of African Americans. Journal of Personality and Social Psychology, 69 (5), 797–811.
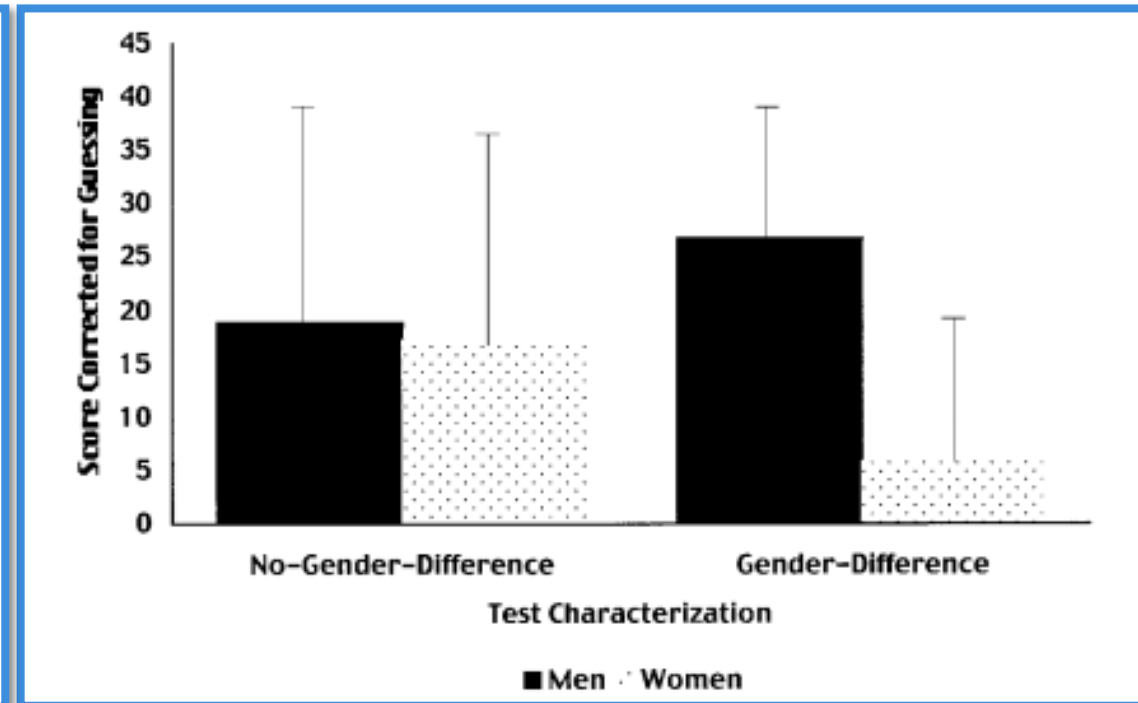Image: https://xkcd.com/385/

# Stereotype Threat

- Stereotype threat causes anxiety and *hinders performance*
- Men do better and *women do worse* when reminded of their gender



**AP Calculus grade by gender and timing of gender inquiry**



**Performance on math test by gender and if subjects were told test previously yielded a gender-difference**

References:
- K. Danaher and C.S. Crandall, "Stereotype Threat in Applied Settings Re-Examined," Journal of Applied Social Psychology
- S.J. Spencer, *et al.*, "Stereotype Threat and Women's Math Performance," Journal of Experimental Social Psychology.

# Combat Stereotype Threat

- **Everyone should:**
  - *Challenge* stereotypes, promote a culture of respect, and stress equal capabilities of women and men in STEM
    - *Share statistics* on the independence of gender and performance
  - Counter negative stereotypes by highlighting and connecting students with *female role models* in STEM

- **Teachers and parents should:**
  - *Inform* students about stereotype threat
  - Have students fill out gender information *after* completing standardized tests

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Imposter Syndrome

- All-encompassing *fear* that you will be exposed as a *fraud*
    - i.e., discover you don't have what it takes

- Often occurs among *high achievers* of all genders who are unable to internalize their success
    - Women in STEM are often high performers
    - Up to 70% of people have likely suffered from imposter syndrome at some point

- Tendency to attribute accomplishments to *external* factors (e.g., luck or a helping hand) as opposed to *internal* factors (e.g., grit, talent, or effort)

References:
- M. Warrell, "Afraid of Being 'Found Out?' Overcome Imposter Syndrome," Forbes, 2014, http://www.forbes.com/sites/margiewarrell/2014/04/03/impostor-syndrome/
- K. Weir, "Feel Like a Fraud?" American Psychological Association, 2013, http://www.apa.org/gradpsych/2013/11/fraud.aspx.

# Overcome Imposter Syndrome

- **Everyone should:**
  - *Share* the symptoms of imposter syndrome
    - It is especially important for students to learn to recognize the signs of imposter syndrome prior to college
  - *Highlight* stories of successful women who have experienced imposter syndrome
    - E.g., Sonia Sotomayor, Tina Fey, Emma Watson, Padma Lakshmi
  - *Discuss* strategies for *owning one's success*
    - *Recognize* one's strengths and accomplishments
  - *Praise* good performance with specific details



Image: www.rosietheriveter.org

# Tiara Syndrome

- Expectation that if you work hard and perform well, your value will be automatically recognized and rewarded

- Women are *less likely* to:
  - Sit at the main table and speak up in meetings
  - Apply for jobs without meeting all of the qualifications
  - Negotiate salaries and raises
  - Self-promote or apply for promotions



- In 2018, LinkedIn found that women *applied to 20% fewer jobs* than men, despite viewing a similar average number of job postings
  - Women were also 26% less likely to ask for a referral
  - In another 2018 study, 68% of male and 45% of female job seekers negotiated for their salary

References:
- [Including Image] C. Cuffley, "How to Avoid 'The Tiara Syndrome' and Accelerate Your Career as a Woman," Thinking Choices, https://www.thinkingchoices.com/avoid-tiara-syndrome-accelerate-career-woman/
- "Gender Insights Report: How women find jobs differently," LinkedIn Talent Solutions, 2019.
- "Survey: 55 Percent Of Workers Negotiated Pay With Last Job Offer," Robert Half, http://rh-us.mediaroom.com/2019-02-13-Survey-55-Percent-Of-Workers-Negotiated-Pay-With-Last-Job-Offer

# Removing the Tiara

- **Students should:**
  - Sit at the main table and *speak up* in meetings
  - *Self-promote* and *negotiate* salaries and raises
    - Leverage peers and websites like Glassdoor to gauge your market value
  - *Apply* for desired jobs, promotions, and leadership positions
    - Interviewing is a great learning opportunity, even if you don't meet all the qualifications

- **Everyone should:**
  - Help others to understand their worth and develop negotiation skills
  - Act as a mentor and *sponsor* for others—encourage them to lean in too

Reference: S. Sandberg, *Lean In: Women, Work, and the Will to Lead*, 1st ed, New York: Alfred A. Knopf, 2013.
Image: www.pinterst.com

# Institutional Obstacles

**Overview**

**Culture**

**Transparency and Clarity**
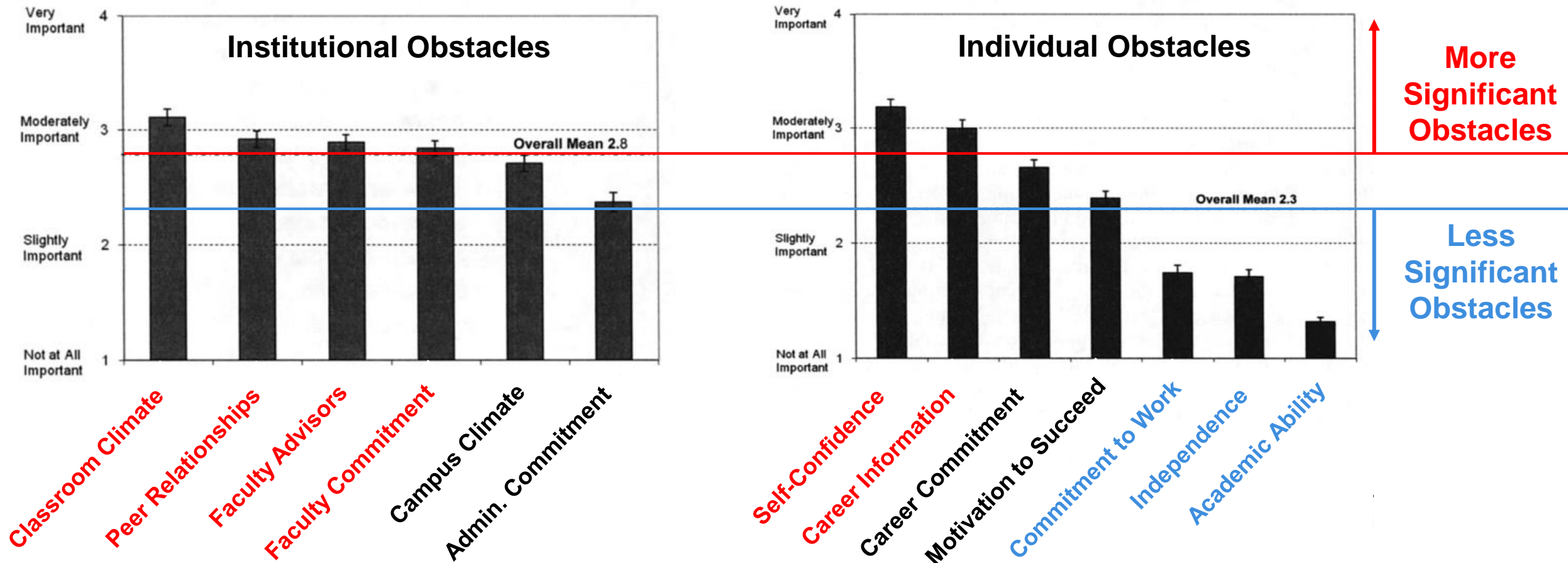
**Abrasiveness Trap**

**Glue Work**



Image: https://portlandenglish.edu/blog/overcoming-obstacles/overcome-climb-wall-obstacle-difficult-work-goal-people-person-esl-english/
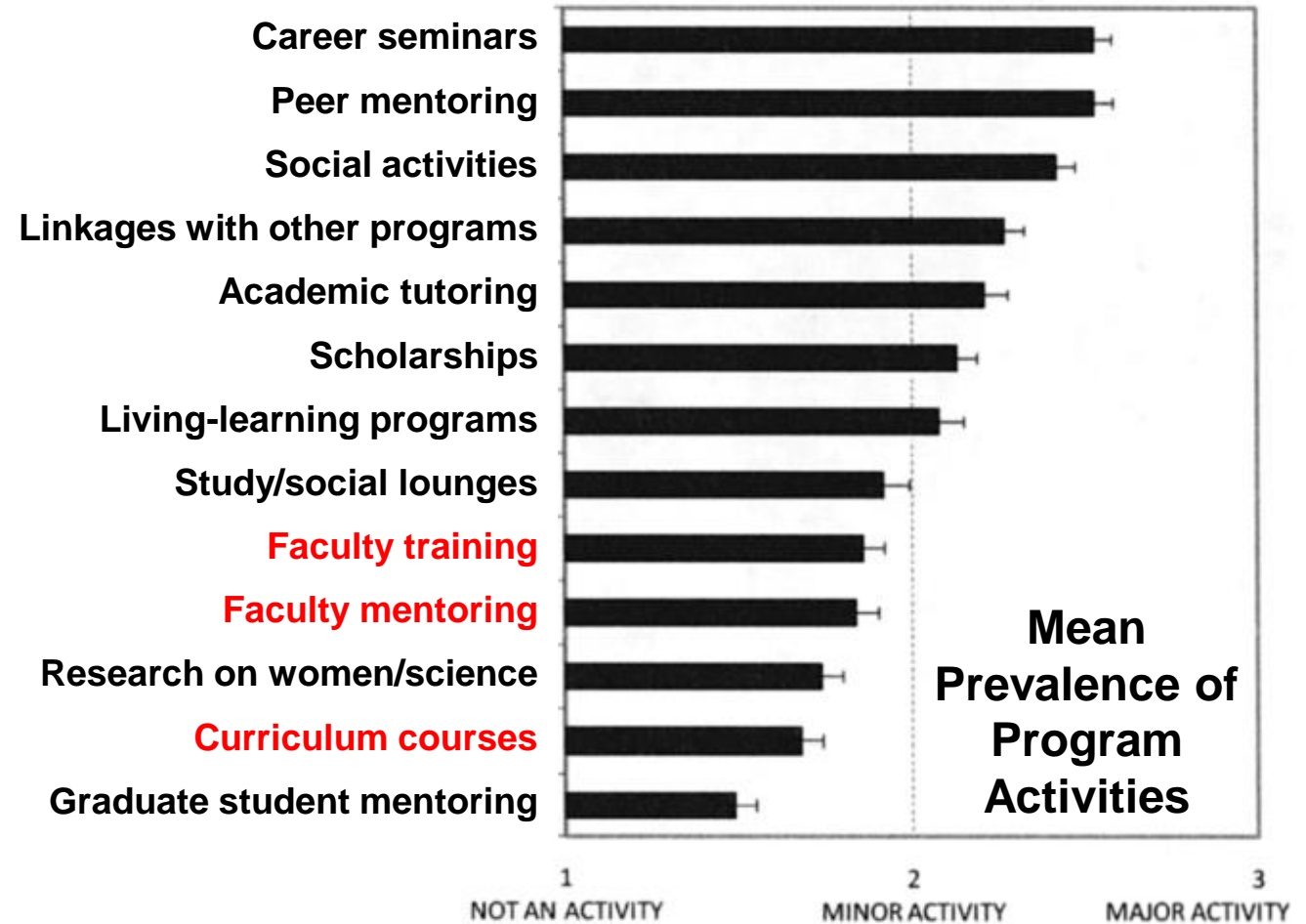
# Importance Ranking of University Obstacles

- According to college women in STEM programs, *institutional obstacles* are more likely to discourage female students than individual obstacles
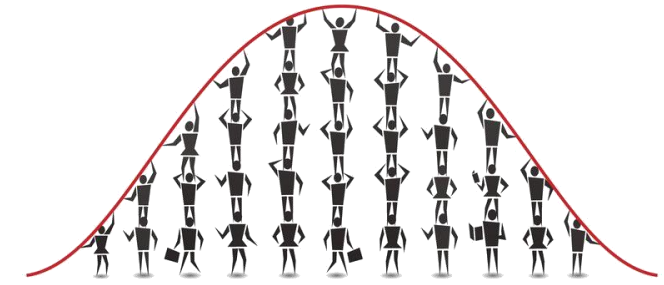


Reference: M. Fox, et al., "Programs for Undergraduate Women in Science and Engineering: Issues, Problems, and Solutions." *Gender & Society*, 25 (5), pp. 589-615, 2011.

# Typical Activities to Address University Obstacles

- The most successful programs for collegiate women in STEM addressed institutional obstacles

- However, the majority of reported activities addressed individual obstacles

- Few activities tackled **classroom climate** and **faculty issues**



**Mean Prevalence of Program Activities**

Career seminars
Peer mentoring
Social activities
Linkages with other programs
Academic tutoring
Scholarships
Living-learning programs
Study/social lounges
Faculty training
Faculty mentoring
Research on women/science
Curriculum courses
Graduate student mentoring

1 NOT AN ACTIVITY    2 MINOR ACTIVITY    3 MAJOR ACTIVITY

# "Weed-Out" Culture

- "Weed-out" courses
  - By design, discourage interested students from pursuing degrees in STEM fields

- Low raw or average exam scores
  - Discourage students who feel low scores reflect a *poor understanding* of course material
  - *Reinforce negative stereotypes* experienced by women in STEM

- Grading on a curve
  - Commonly described as *frustrating*, *discouraging*, and *demoralizing*
  - Shifts focus of exams from mastering material to outperforming other students, *reinforcing imposter syndrome*
  - Leads to performance uncertainty

References:
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- J. Wolfe and B.A. Powell, "'Engineering Beats You Up': Problems with Relying on the Bell Curve," 121st ASEE Annual Conference & Exposition
Image: https://www.thoughtco.com/grading-on-a-curve-3212063

# Alienating Culture

- Because STEM fields are considered "masculine," boys are much likely to develop an *early and passionate interest* in STEM careers
  - Women are more likely to have a *moderate interest that builds gradually*

- In college, this passionate male model of "doing" engineering or computer science "*shapes* assumptions of *who will succeed* and *who belongs*"
  - This culture causes women to feel like *misfits*, lowering their confidence and interest

- Underrepresented students face additional feelings of *isolation*, reducing their ability to overcome the social phenomena that lower self-efficacy

References:
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- J. Margolis and A. Fisher, "Unlocking the clubhouse: Women in computing," Cambridge: Massachusetts Institute of Technology, 2002.

# Create a Welcoming Culture

- **Universities should:**
    - *Reevaluate* traditional grading methodology for STEM programs
    - Send an *inclusive message* about who makes a good STEM student
        - Encourage and value *diverse interests, skills, and experiences*
    - Actively perform *outreach* and *recruitment* of diverse students
    - Improve the pipeline of support
        - Create and support *communities* for women in STEM
        - Increase the number of *female mentors and role models* in academia and industry
        - Facilitate *student-faculty interaction*

- **Everyone should:**
    - Be your *authentic selves* and create an inclusive environment for others to do the same

References:
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- L. Goodman and L., Damour, "Engaging Girls in STEM: Role Models," Center for Research on Girls at Laurel School, 2011.

# Sexual Harassment

- Organizational climate is the greatest predictor of the occurrence of sexual harassment

- 50% of female engineering faculty and staff experience sexual harassment

- Depending on discipline, ***20-50% of all engineering students*** experience harassment from faculty or staff

**The cumulative effect of sexual harassment is significant damage to the research integrity and a costly loss of talent in academic sciences, engineering, and medicine**

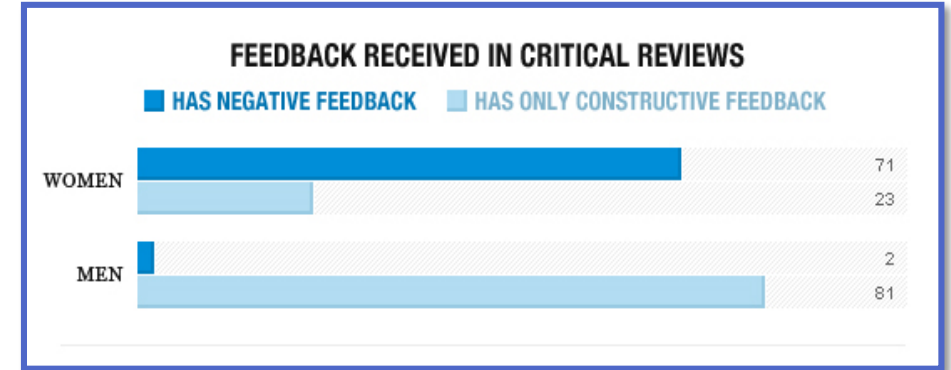# Perception Challenges: Transparency and Clarity

- Opaque grading policies
  - e.g., grading on a curve, delayed return of grades, or arbitrarily assigned team project grades

- Vague or infrequent performance reviews and interview feedback
  - Causes *uncertainty in performance expectations* and standards
  - Difficult to improve performance without *constructive and actionable feedback*
  - Can lead to a *perception of bias* and *discourage* applying for future positions

- Unclear selection criteria for awards, grants, and hiring
  - Without clear selection criteria, *unconscious biases* can influence decisions
  - Enables claims that women are selected over *"more qualified"* men in the name of diversity

> Uncertainty can cause women to fall back on stereotypes as "cognitive crutches" to assess their performance – Sociologist Shelley Correll

Reference: C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.

# Perception Challenges: The Abrasiveness Trap

- High achieving men and women are *described differently* in performance reviews

- "Words like *bossy*, *abrasive*, *strident*, and *aggressive* are used to describe women's behaviors when they *lead*."
  - And **71** of **94 (75.5%)** critical reviews of **women**
  - Appeared in **2** of **83 (2.4%)** critical reviews of **men**

- In order to be considered leaders – *and likeable* - women must "*do something masculine, but in a feminine vein*"

**FEEDBACK RECEIVED IN CRITICAL REVIEWS**

■ HAS NEGATIVE FEEDBACK    ■ HAS ONLY CONSTRUCTIVE FEEDBACK

| | |
|---|---|
| WOMEN | 71 |
| | 23 |
| MEN | 2 |
| | 81 |

"Men are given constructive suggestions. Women are given constructive suggestions – and told to pipe down."

References:
- K. Snyder, *The Abrasiveness Trap: High Achieving Men and Women are Described Differently in Reviews*, 2014, http://fortune.com/2014/08/26/performance-review-gender-bias/
- S. Nurhussein, *Gendered Code Words: Recent Study Examines the "Abrasiveness Trap,"* Sept. 2014, https://www.shatteringtheceiling.com/gendered-code-words-recent-study-examines-the-abrasiveness-trap/

# Perception Challenges: Glue Work

- Glue work – the less glamorous (and ***often less-promotable***) work required for team success:
  - Interviewing and onboarding
  - Performing diversity and inclusion work
  - Organizing meetings and social events
  - Identifying gaps on projects before they create issues
  - Being the unofficial lead and developing team strategies



- In one study:
  - Women volunteered to do non-promotable tasks ***48% more often*** than men
  - Managers asked women to do non-promotable tasks ***44% more often*** than they asked men

> Can lead to perceptions of women being "not technical enough"

References:
- L. Babcock , M. P. Recalde and L. Vesterlund, "Why Women Volunteer for Tasks That Don't Lead to Promotions," Harvard Business Review, 2018, https://hbr.org/2018/07/why-women-volunteer-for-tasks-that-dont-lead-to-promotions
- [Including Image] T. Reilly, "Technical Leadership and Glue Work," No Idea Blog, 2019, https://noidea.dog/glue

# Improving Perception Challenges

- **Students should:**
  - Work with faculty and supervisors to understand performance expectations
  - Regularly **_seek feedback_**

- **Universities and employers should:**
  - Develop and communicate **_clear selection criteria_** for awards, hiring, raises, and promotions
    - Provide **_detailed and constructive feedback_** to candidates
  - Establish clear **_performance expectations_** and provide **_regular (actionable) feedback_**
  - Communicate when work being performed **_isn't promotable_**
    - Split necessary, non-promotable work evenly
    - Publically recognize valuable glue work – highlight impact and technical elements

References:
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- T. Reilly, "Technical Leadership and Glue Work," No Idea Blog, 2019, https://noidea.dog/glue

# Key Takeaways

- To reduce the gender gap in STEM, we must:
    1) Work to **_eliminate societal differences_** in the treatment of boys and girls
    2) Recognize that these differences influence how:
        - Women **_perceive_** their own abilities and performance in STEM
        - Men and women perceive the performance of their female peers
        - Women **_respond_** to institutional obstacles
    3) Actively seek to improve the educational and workplace environments to attract and retain women in STEM


- Be an **_active ally_** by **_discussing the obstacles_** faced by women in STEM and **_advocating for solutions_**

# References

- L. Babcock , M. P. Recalde and L. Vesterlund, "Why Women Volunteer for Tasks That Don't Lead to Promotions," HBR, 2018, https://hbr.org/2018/07/why-women-volunteer-for-tasks-that-dont-lead-to-promotions
- V.L. Brescoll, "Who Takes the Floor and Why: Gender, Power, and Volubility in Organizations." Administrative Science Quarterly, 29 February 2012.
- B. Cislaghi, L. Heise, "Gender norms and social norms: differences, similarities and why they matter in prevention science," Sociology of Health & Illness, 42(2): 407–422. February 2020.
- C. Cuffley, "How to Avoid 'The Tiara Syndrome' and Accelerate Your Career as a Woman," Thinking Choices, https://www.thinkingchoices.com/avoid-tiara-syndrome-accelerate-career-woman/
- K. Danaher and C.S. Crandall, "Stereotype Threat in Applied Settings Re-Examined," Journal of Applied Social Psychology
- C. Dweck, "What Having a 'Growth Mindset' Actually Means," Harvard Business Review, 2016
- M. Fox, et al., "Programs for Undergraduate Women in Science and Engineering: Issues, Problems, and Solutions." Gender & Society, 25 (5), pp. 589-615, 2011.
- L. Goodman and L., Damour, "Engaging Girls in STEM: Role Models," Center for Research on Girls at Laurel School, 2011.
- H.G. Halvorson, "The Trouble With Bright Girls," Psychology Today, https://www.psychologytoday.com/blog/the-science-success/201101/the-trouble-bright-girls
- A.B. Hancock and B.A. Rubin, "Influence of Communication Partner's Gender on Language," Journal of Language and Social Physchology, 11 May 2014.
- J. Handelsman and N. Sakraney, "Implicit Bias," White House Office of Science and Technology Policy, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/bias_9-14-15_final.pdf
- K. Heath, J. Flynn, M.D. Holt, "Women, Find Your Voice." Harvard Business Review, June 2014.
- M. Heilman and J. Chen, "Same Behavior, Different Consequences: Reactions to Men's and Women's Altruistic Citizenship Behavior," Journal of Applied Psychology, 90 (3), pp. 431–441, 2005.
- C. Hill, C. Corbett, and A. St. Rose. "Why So Few? Women in Science, Technology, Engineering, and Mathematics," AAUW, 2010.
- J. Margolis and A. Fisher, "Unlocking the clubhouse: Women in computing,"  Cambridge: Massachusetts Institute of Technology, 2002.
- D. I. Miller et al., "Development of Children's Gender-Science Stereotypes: A Meta-analysis of 5 Decades of U.S. Draw-A-Scientist Studies," Child Development, Vol 89, Issue 6, 2018.
- C.A. Moss-Racusin, et al., "Science Faculty's Subtle Gender Biases Favor Male Students," PNAS.
- S. Nurhussein, *Gendered Code Words: Recent Study Examines the "Abrasiveness Trap," Sept. 2014,* https://www.shatteringtheceiling.com/gendered-code-words-recent-study-examines-the-abrasiveness-trap/
- R. Premack, "43 jobs that are dominated by women," Business Insider, 2018, https://www.businessinsider.com/teacher-nurse-salary-jobs-for-women-2018-6.
- T. Reilly, "Technical Leadership and Glue Work," No Idea Blog, 2019, https://noidea.dog/glue
- S. Sandberg, Lean In: Women, Work, and the Will to Lead, 1st ed, New York: Alfred A. Knopf, 2013.
- S.J. Spencer, et al., "Stereotype Threat and Women's Math Performance," Journal of Experimental Social Psychology.
- K. Snyder, The Abrasiveness Trap: High Achieving Men and Women are Described Differently in Reviews, 2014, http://fortune.com/2014/08/26/performance-review-gender-bias/
- C.M. Steele and J. Aronson, (1995). Stereotype threat and the intellectual test performance of African Americans. Journal of Personality and Social Psychology, 69 (5), 797–811.
- D. Tannen, "The Power of Talk: Who Gets Heard and Why," Harvard Business Review, October 1995.
- M. Warrell, "Afraid of Being 'Found Out?' Overcome Imposter Syndrome," Forbes, 2014, http://www.forbes.com/sites/margiewarrell/2014/04/03/impostor-syndrome/
- K. Weir, "Feel Like a Fraud?" American Psychological Association, 2013, http://www.apa.org/gradpsych/2013/11/fraud.aspx.
- S. Weiss, "15 Microaggressions Women Face On A Daily Basis, Bustle," 2015, https://www.bustle.com/articles/119429-15-microaggressions-women-face-on-a-daily-basis-because-they-all-add-up-to-an-unequal
- J. C. Williams, S. Li, R. Rincon, and P. Finn. "Climate Control: Gender and Racial Bias in Engineering?" Center for Worklife Law & Society of Women Engineers, 2016.
- J. Wolfe and B.A. Powell, "'Engineering Beats You Up': Problems with Relying on the Bell Curve," 121st ASEE Annual Conference & Exposition
- Emily's Wonder Lab, Netflix, https://www.netflix.com/title/81128389
- "Gender Insights Report: How women find jobs differently," LinkedIn Talent Solutions, 2019.
- "A Guide to Responding to Microaggressions," University of Illinois Grainger College of Engineering: Women in Engineering, https://wie.engineering.illinois.edu/a-guide-to-responding-to-microaggressions/
- "Science & Engineering Indicators: The State of U.S. Science and Engineering 2020," National Science Board, 2020.
- "Survey: 55 Percent Of Workers Negotiated Pay With Last Job Offer," Robert Half, http://rh-us.mediaroom.com/2019-02-13-Survey-55-Percent-Of-Workers-Negotiated-Pay-With-Last-Job-Offer