IDENTIFYING AND INTERRUPTING GENDER AND RACIAL BIAS IN STEM

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DR. COLEMAN'S SELFIE

Race / Ethnicity

Black /
African American

Sex & Sexual Orientation

Female and Heterosexual

Gender / Pronouns
Cisgender
She, Her, Hers

Religion

Christian - Catholic

Age / Class / Ability
Middle Age / Class
Able-bodied
Emotionally Well

Values / Beliefs

Educational and STEM Equity,
Inclusiveness, Social Justice

Do I have Bias?
Am I a good person?

Yes and Yes

**Biased language used
against me?**
Incompetent, I don't see Color
Angry Black Woman

**Social Injustices I've
confronted**
Racism, Sexism, Colorism

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DIMENSIONS OF DIVERSITY

Includes all the ways in which people differ, and it encompasses all the different characteristics that make one individual or group different from another. A broad definition includes not only race, ethnicity, and gender — the groups that most often come to mind when the term "diversity" is used — but also age, national origin, religion, disability, sexual orientation, socioeconomic status, education, marital status, language, and physical appearance. **It also involves different ideas, perspectives, and values.**

Race

Biological Sex/
Sexual Orientation

Gender & Pronouns

Religion

Age/Class/Ability

Values/Beliefs

Do I Have Bias?/
Am I A Good Person?

BIAS Language

Social Injustice I've Confronted

BIAS . . .

"Explicit bias" refers to the attitudes and beliefs we have about a person or group on a conscious level. Much of the time, these biases and their expression arise as the direct result of a perceived threat. When people feel threatened, they are more likely to draw group boundaries to distinguish themselves from others.

"Implicit bias" refers to the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner…it is the mental process that causes us to have negative feelings and attitudes about people based on characteristics like race, ethnicity, age and appearance.

THE REALITY OF BIAS

SAME CRIME, SAME DAY, SAME NEWS ORGANIZATION

ROOT CAUSE OF BIAS: CYCLE OF SOCIALIZATION

SOURCE: TEACHING FOR DIVERSITY AND SOCIAL JUSTICE BY MAURIANNE

First Socialization
Unbiased, Non-Judgmental, Parental and Family Culture

CORE
Fear
Ignorance
Confusion
Insecurity

Actions
Do Nothing, Don't Make Waves, Promote Status Quo

Institutional and Cultural Socialization
Churches, Schools, Social Media, Television, Organizations

Resulting In...
Dissonance, Silence, Violence, Dehumanization, Self-Hatred, Guilt

Enforcements
Privilege
Oppression

Break the Cycle...
Change, Raised Consciousness, Interruption, Education, Advocacy, Transformation

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IDENTIFYING AND INTERRUPTING IMPLICIT BIAS

STRATEGIES FOR CONFRONTING UNCONSCIOUS BIAS, BY KATHLEEN NALTY

Give up being color/gender/age blind.	Engage in mindfulness exercises on a regular basis.
Retrain your brain.	Have Courageous Conversations - Engage in cross-difference relationships.
Actively doubt your objectivity	Mix it up.
Be mindful of snap judgments.	Shift perspectives.
Oppose your stereotyped thinking.	Find commonalities.
Deliberately expose yourself to counter-stereotypical models and images.	Reduce stress, fatigue, cognitive overload, and time crunches.
Remind yourself that you have Implicit (unconscious) Bias.	

IMPLICIT BIAS IN STEM

- "Implicit bias" refers to the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner…it is the mental process that causes us to have negative feelings and attitudes about people based on characteristics like race, ethnicity, age and appearance"

¬ Our modern understanding of science and knowledge originates from the European Enlightenment.

¬ Nonwhites and women have historically been viewed as emotional, irrational, childlike, and not possessing scientific capabilities.

¬ Beyond the structures that hinder minority and gender gains in the sciences, interpersonal biases continue to be a factor for those who work in the STEM fields.

¬ Research continues to demonstrate how academic and workplace settings are often spaces in which feminine and ethnic identities are not valued or recognized.

¬ The historical and institutional meaning of what it means to be a scientist (a white male identity) continues to underprivilege diverse populations.

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3 BLACK D.C. STUDENTS FACE RACIST BACKLASH IN NASA COMPETITION

RACIST ATTACKS ON TEENS SABOTAGE NASA COMPETITION

NBC NEWS

IMPLICIT BIAS IN STEM

- "Implicit bias" refers to the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner…it is the mental process that causes us to have negative feelings and attitudes about people based on characteristics like race, ethnicity, age and appearance"

What BIAS in STEM and in SOCIETY have you confronted?

HOW???

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STEMTalks

DIVERSIFYINGSTEMMATTERS

*"The National Academy of Sciences suggests that, without the participation of individuals of all races and genders, the increasing demand for workers in **STEM** fields will not be met, potentially compromising the position of the United States as a global leader".*

"The additional benefit of developing a STEM-literate and well-trained diverse workforce is that this ensures that we adequately address challenges related to healthcare improvement, national production capacity, and research excellence" (Allen-Ramdial & Campbell, 2014).

"The National Action Council for Minorities in Engineering believes that diversity in STEM leads to improved decision-making, enhanced innovation and problem-solving" (2017).

STEM DEGREES AS A PERCENTAGE OF TOTAL DEGREES
ACADEMIC YEAR 2013–14

U.S. DEPARTMENT OF EDUCATION   HTTPS://NCES.ED.GOV/PUBS2017/2017051.PDF.   NATIONAL SCIENCE FOUNDATION.
HTTPS://WWW.NSF.GOV/STATISTICS/2018/NSB20181/ASSETS/561/TABLES/AT02-19.PDF
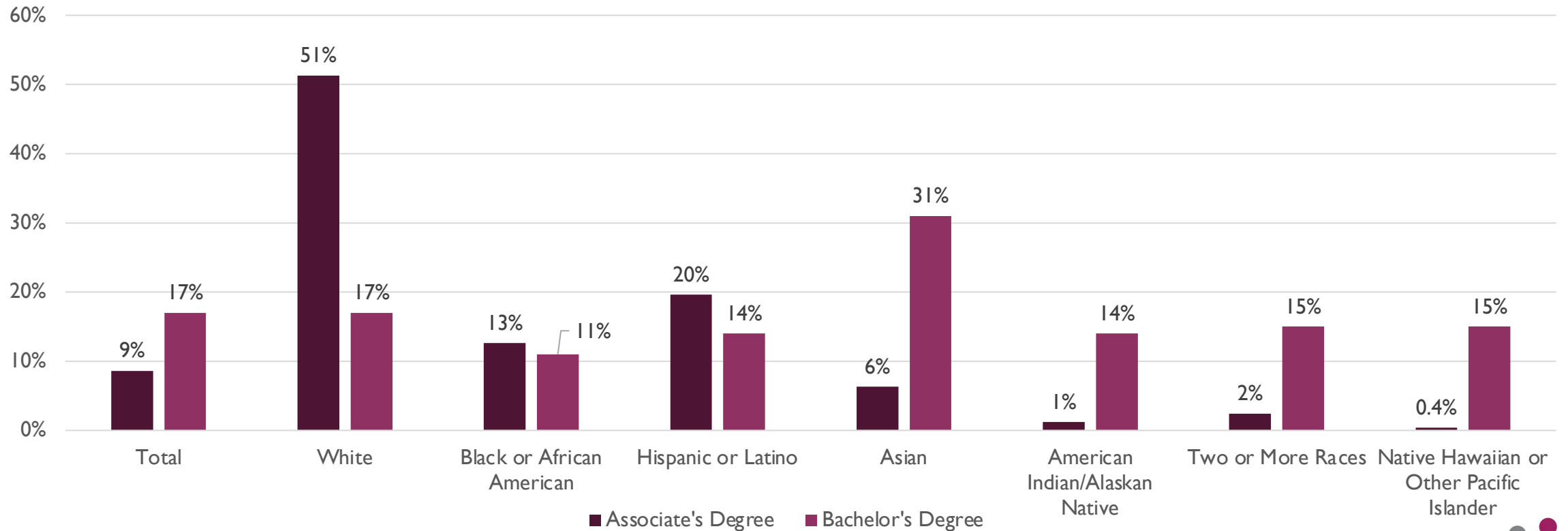
STEM WORKFORCE BY RACE OR ETHNICITY - NATIONAL SCIENCE FOUNDATION, 2019

■ **Total Workforce**   ■ **STEM Workforce**

Category	Total Workforce	STEM Workforce
AMERICAN INDIAN/ALASKAN NATIVE	0.5	0.4
ASIAN	6.2	9.3
BLACK OR AFRICAN AMERICAN	11.6	8.5
HISPANIC OR LATINO	17.8	14.2
NATIVE HAWAIIAN OR PACIFIC ISLANDER	0.2	0.2
SOME OTHER RACE OR MORE THAN ONE RACE	2.2	2.1
WHITE	61.4	66.3
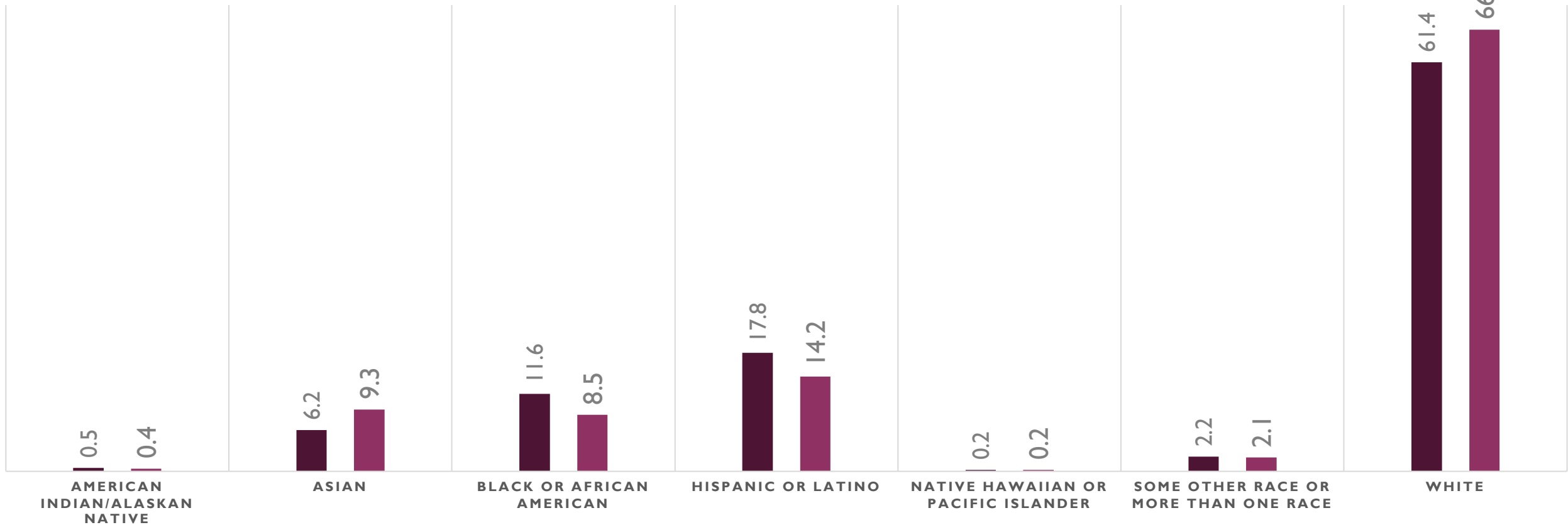
❑ According to the Washington-based Center for Political and Economic think tank, **the U.S. workforce could employ as many as 140,000 additional Black and Latino college graduates in STEM fields** annually if the gap in college completion by Blacks and Latinos closed to roughly match that of the White and Asian student graduation rates (Roach, 2014).

❑ According to the U.S. Census Bureau, the median income for Blacks is $32,229 and $ 38,624 for Latinos, almost $20,000 less than Whites; but **for Latinos and Blacks in STEM careers, the median income is $75,000** which is only about $10,000 less than Whites (Landivar, 2013).

STEM WORKFORCE BY SEX - REPRESENTATION OF WOMEN IN STEM
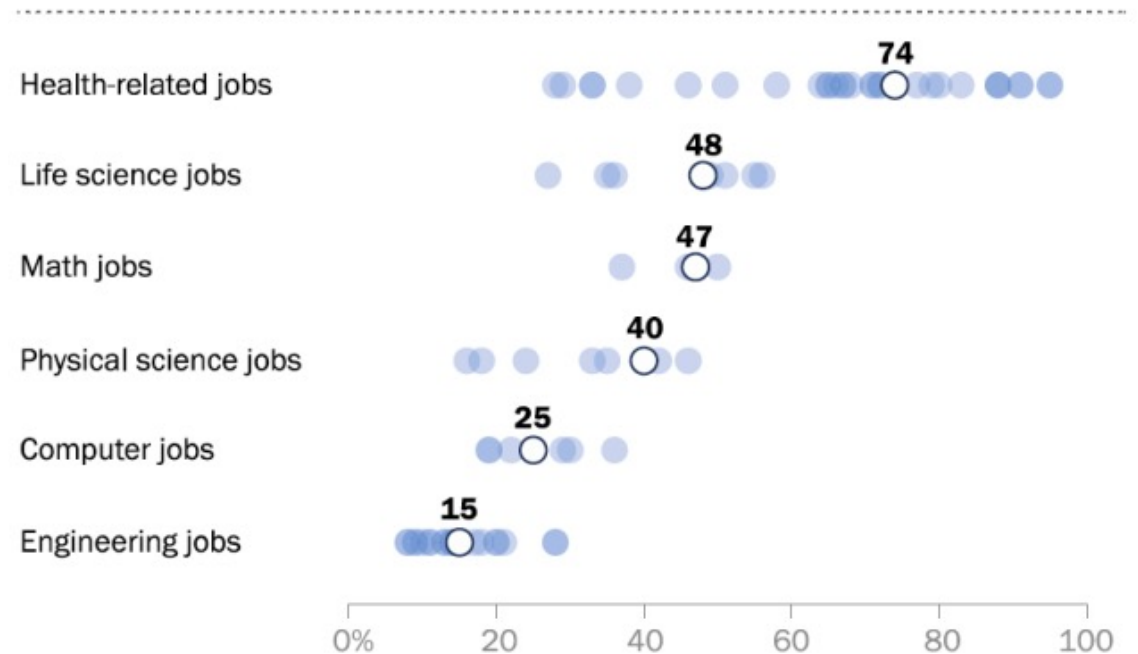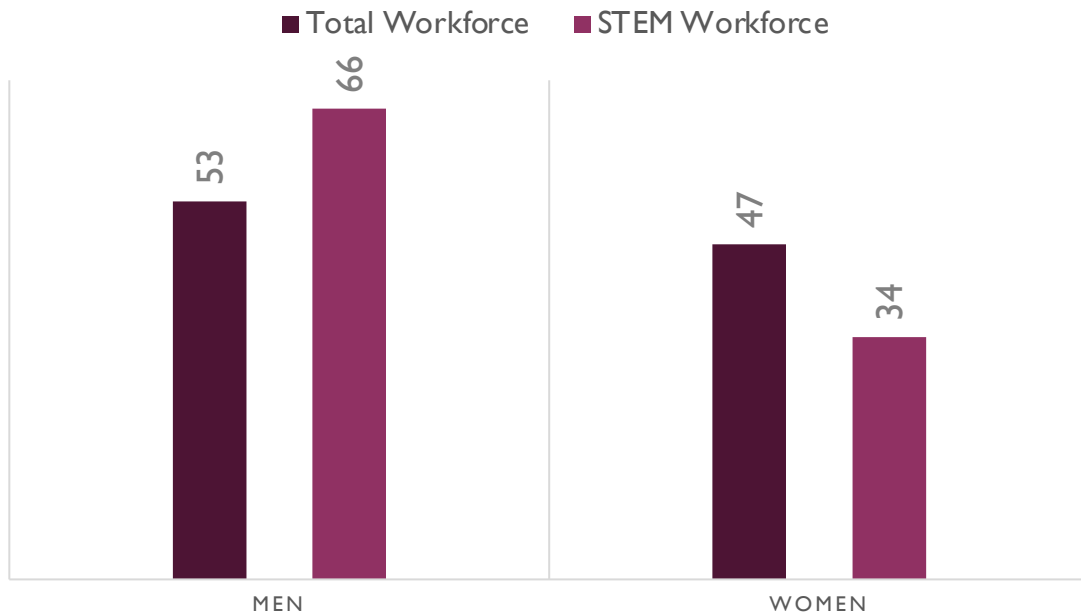
PERCENT OF U.S. WOMEN IN STEM WHO REPORT...

having to provide more evidence of competence than others to prove themselves.	that colleagues have suggested they should work fewer hours after having children.	that at work, they find themselves pressured to play a stereotypically feminine role.*	that women in their work environments support one another.	they've been mistaken for either administrative or custodial staff.
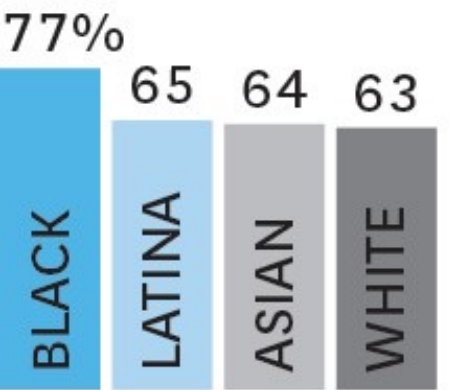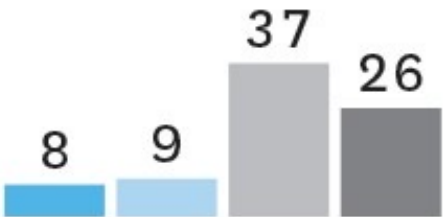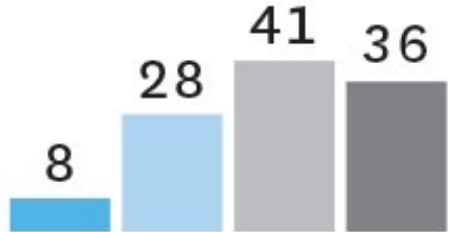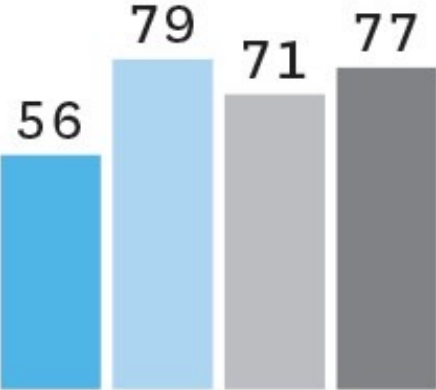
Bar chart data (Black, Latina, Asian, White):

Category	BLACK	LATINA	ASIAN	WHITE
having to provide more evidence of competence	77%	65	64	63
colleagues suggested fewer hours after children	8	9	37	26
pressured to play stereotypically feminine role	8	28	41	36
women in work environments support one another	56	79	71	77
mistaken for administrative or custodial staff	48	47	23	32
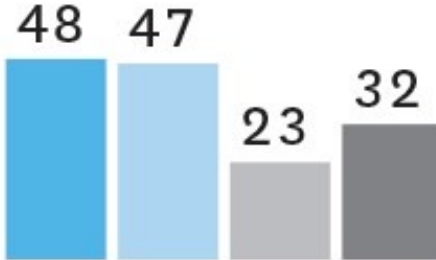
*SUCH AS "OFFICE MOTHER" OR "DUTIFUL DAUGHTER."
SOURCE JOAN C. WILLIAMS, KATHERINE W. PHILLIPS, AND ERIKA V. HALL

HBR.ORG

ACROSS ALL RACIAL AND ETHNIC GROUPS, WOMEN IN STEM EARN LESS THAN THEIR MALE COUNTERPARTS

Category	Earnings
All jobs	$50,900
Non-STEM jobs	$46,900
STEM jobs	$77,400

Among workers in STEM jobs who are ...

Category	Earnings
Asian men	$103,300
White men	$90,600
Asian women	$88,600
Hispanic men	$73,000
Black men	$69,200
White women	$66,200
Black women	$57,000
Hispanic women	$57,000

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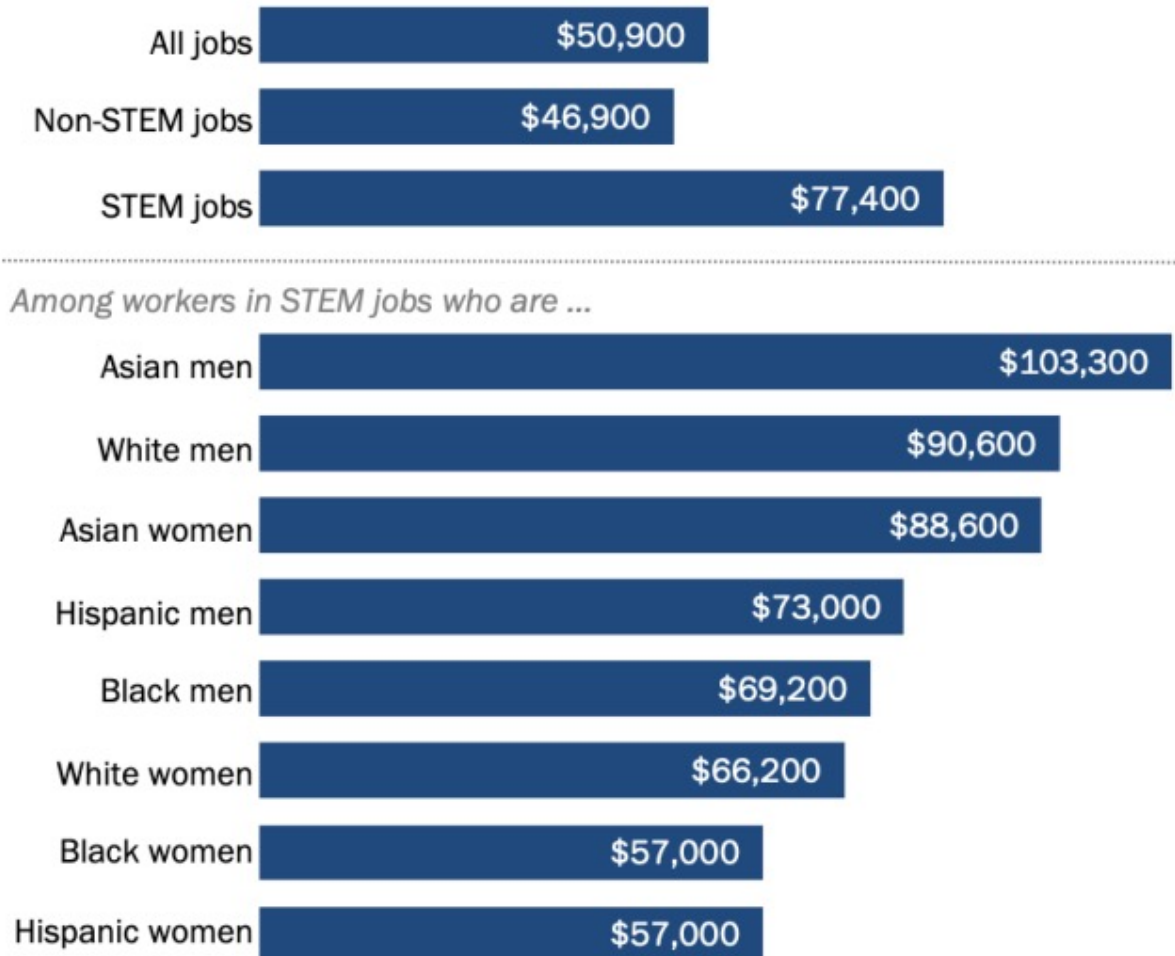
Cultural Perception Gap
Professors' Biased Evaluations of Physics and Biology Post-Doctoral Candidates…

Physics faculty exhibited a gender bias favoring the male candidates as more competent and more hirable than the otherwise identical female candidates.

Physics faculty rated Asian and White candidates as more competent and hirable than Black and Latino candidates.

Biology faculty rated Asian candidates as more competent and hirable than Black candidates, and as more hirable than Latinx candidates.

Black women and Latino women and men candidates were rated the lowest in hireability compared to all others.

Women were rated more likeable than men candidates across departments.

The Intersect Between Racial and Gender Bias in STEM

THE RACIALLY-BASED STEM EDUCATION TO CAREER GAP

The 2015 U.S. News/Raytheon STEM Index indicates a slow progression in addressing these inequities that are a result of :

"Early Bias, Discrimination and Social Expectations"

Lack of STEM exposure in K-12

Lack of a STEM mentor

Mathematics phobia

Failure of students to see the application of science to their lives

Funding inequities in K-12 system

- "favoring schools and communities that have access to the most resources, knowledge, and expertise", which typically does not include the Black and Latinx communities (Riegle-Crumb & King, 2010)

Feelings of isolation – Cool Pose – Racial Identity Conflict

Having lower expectations for students of color leads to a lack of diversity in STEM (NSF, 2014; Riegle-Crumb & King, 2010).

Strong STEM pedagogy and resources are typically lacking in these schools and there's an inclination to "address a perceived deficit with the student, rather than a focus on changing the system and delivery of STEM instruction to more effectively support and draw on students' strengths" (Henderson & Lawson, 2015).

THE GENDER-BASED STEM EDUCATION TO CAREER GAP

The classroom climate for girls in school classrooms and for women students and faculty in university departments has been classically described as "chilly". Girls and women are treated differently than men in both subtle and overt ways.

A dearth of role models is another contributing factor to the underrepresentation of women in science.

Poor preparation and lack of encouragement in STEM subjects in school also contributes to a lack of women in STEM fields.

A lack of "critical mass" of women in a department may lead to dissatisfaction and greater attrition of women scientists

Bias and discrimination in hiring and advancement of women leads to slower advancement of women in science, particularly in academic science.

Salary differences and low status continue to plague women across sectors of employment.

D-STEM Equity Model

Diversifying STEM Education to Career Pathway

The Systemic Problem
Racial Inequity in STEM Education and Careers

Vision Gap + Opportunity Gap + Cultural Perception Gap + STEM Education Gap + Generational Gap + Economic Gap + Identification Gap + STEM Professional to Educator Gap = Racial Equity in STEM Education and Careers

STEM Motivation
Factors that generate interest in and motivate Black and Latino students to engage in STEM education, majors and careers

- Early STEM Exposure
- Culturally Responsive STEM Curriculum
- Conversations on Race
- Personalized Assessment and Evaluation
- STEM Leadership Development

Increase in motivation of Black and Latino students to engage in STEM education

Bridging the Racial STEM Divide
Policy-driven mandates to form stakeholder collaboration and funding

STEM Policy Development →

Collaborative STEM Initiative
STEM Education Community Organizations STEM Industry

Culturally Responsive Pedagogy
Teacher Certification and Professional Learning Curriculum

Racially-based collaborative stakeholder approach to STEM programming (PreK-16) mandated by policy that addresses problems collectively and is driven by STEM motivation factors, with an emphasis on developing culturally-responsive teachers

Diversified STEM Education to Career Pathway

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VALENCIA,

a student who identifies as Native American and Chicana is struggling in her engineering classes as an undergraduate at a predominantly White research university…

"I think what happens—and I noticed this happened to a few of my other peers, too—is you could either choose to take that experience and be like, "Okay, I'm going to ask for help and I'm going to go everywhere, go crazy and get all this help." Or I could internalize it and just be like, "Okay, I'm just going to work really hard in the middle of the night. Try and figure this stuff out on my own." And I feel that sense of having to isolate myself and be 'independent,' you know, that confusion between isolation and independence—it really blurred things for me. And it made the situation worse because now no one knew what was going on, what I was going through. And no one knew how to help. And I didn't know how to reach out for help, I felt really ashamed that I don't know how to talk to a professor. The professor is this big authority figure and I don't know how to talk to him. You know, what am I going to talk to him about? I don't know how to joke around with a professor. In engineering classes, everybody's so stiff and it feels so competitive. It feels so cold and not welcoming and it feels so… I just feel sad."

CASE STUDY

VALENCIA, a student who identifies as Native American and Chicana is struggling in her engineering classes as an undergraduate at a predominantly White research university…

""So it was my junior year as an undergrad that I finally just reached out to a Latina who was a postdoc at the time…. I didn't know her that well, but I just emailed her and I was like, "Look, no one knows I'm doing bad, but I'm doing bad and I need help and I don't know who to turn to. And I'm afraid I might have to drop out." And so she emailed me back, "Call me." She's like, "Okay, let's meet." And so we met and she was just like, "Look, it's not that you aren't good enough to be here. You are. It's just that you need some"—she would always say this—"tools in your toolbox. It's like you want to build a house and you can have all the desire and effort to build a house, but if you don't have the right tools, you're not going to get anywhere." So she really helped me clarify a lot that was going on internally. I was like, "Am I just messing up? I've been working so hard but yet I'm still getting bad grades. I'm busting my butt but I'm not getting anywhere." So, she was really the one to teach me these kinds of tools in your toolbox. Like, time management or goal planning. You know, just looking at the long-term things and which resources to go to".

CASE STUDY

COMPLETE THIS SENTENCE

Fortunately, just before she reached the point of failing her class and potentially not engaging in STEM Education, VALENCIA…

- What are Valencia's next steps?

- How can Valencia get the assistance that she needs?

- How can she confront the stereotypical image that is serving as a barrier for her to ask for assistance?

- If Valencia asked you for advice, what would you tell her, how would you help?

CASE STUDY

SELF-CONCEPT

Self-concept, strictly defined, is the totality of our beliefs, preferences, opinions and attitudes organized in a systematic manner, towards our personal existence. Simply put, it is how we think of ourselves and how we should think, behave and act out our various life roles.

Self-Concept

Self-Knowledge

The Self

Self-Esteem

Social Self

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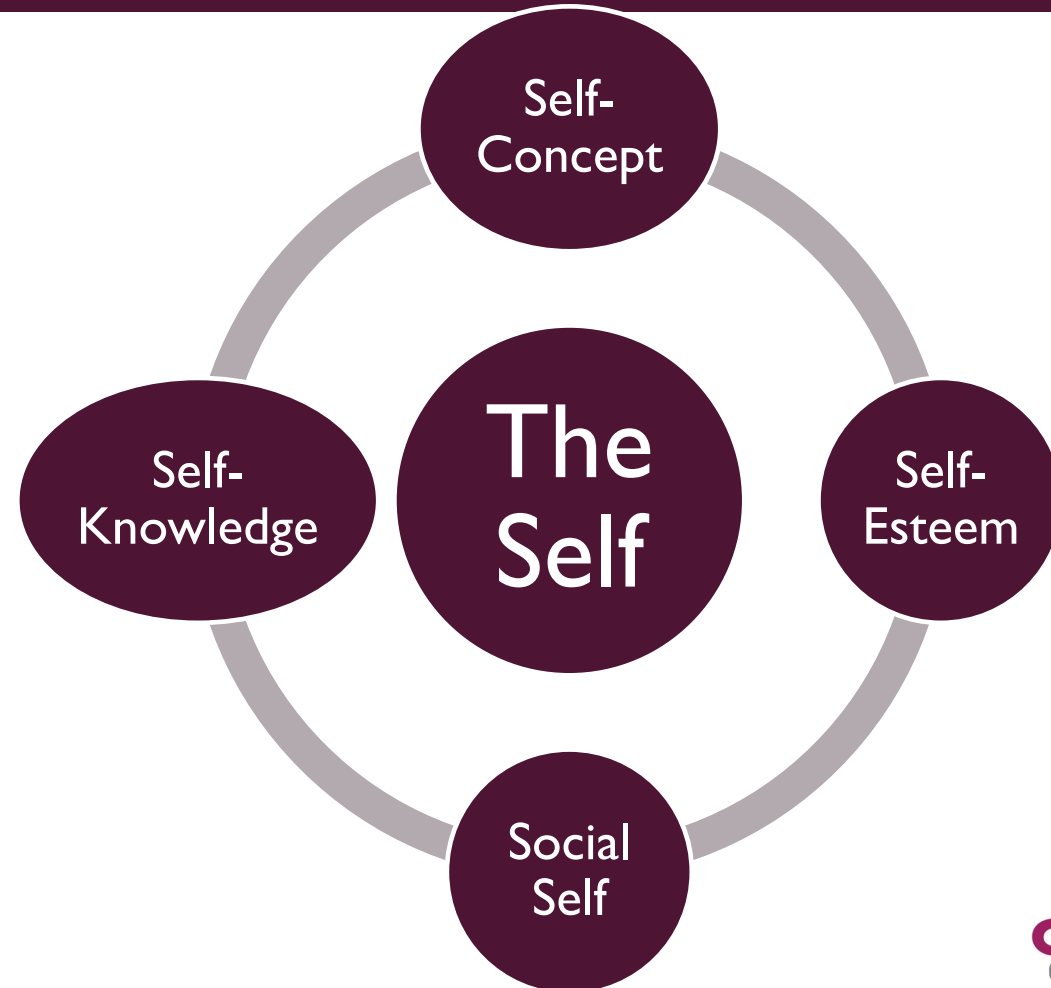
GROWTH MINDSET – POSITIVE STEM IDENTITY

What made you think hard this week?	How will you challenge yourself today?	What can you learn from this experience or mistake?	What would you do differently next time to make things work better?	What else do you want to learn?
What strategy can you try?	Who can you ask for honest feedback?	Did you work as hard as you could have?	If it was too easy, how can you make it more challenging?	Did you hold yourself to high expectations or did you accept "good enough"?
Did you ask for help if you needed it?	What can you do to manage distractions?	Have you reviewed your work or logic for errors or flaws?	Are you proud of the end result? Why or why not?	What's the next challenge to tackle?

D-STEM Equity Model Systemic Problem	Self-Advocacy Skill	In-Practice
Vision Gap STEM Education Gap	**Speak Out, Speak Up**	Teach students to have courageous conversation about racial equity with administrators and educators to transform STEM education.
Cultural Perception Gap	STEM Cohesion	Develop a sense of belonging of students in the STEM community and the understanding that their STEM skills will assist in advancing the human condition of their respective communities; and then teach them how to share with others through presentations, articles, workshops, blogs, etc. Also, teach students how to create support networks with others in the STEM space.
Cultural Perception Gap STEM Education Gap	**Stereotype Management**	A temporary resolution that focuses on responding to stereotypes rather than ending them; teach students' strategies for social justice along with strength and resilience, as well as the ability to stand up for racial inequity in both verbal and written format to individuals and systems.
Identification Gap	STEM Capital	Related to the STEM aspirations and identification with STEM, teach them how to showcase their STEM interest and ability, while advocating for STEM experiences of interest (research, interns) which will help them demonstrate STEM literacy and may inform an identification protocol.

Building Positive STEM Identity

Know Yourself…	✓ *Invest in your own agenda, as an antidote to acting like or unlike the stereotype.* ✓ *Cultivate self knowledge that challenges the stereotype.* ✓ *Foster your drive to be seen as your real self. Remember, you are more lovable than the stereotype!*
Prepare Yourself…	✓ Expect stereotyping. Budget it in. ✓ Know the specifics. Understand the typical ways you are likely to be stereotyped, when, where, who. ✓ Blame the process, not your body.
Impact the Situation when Possible…	✓ Collect proven ways to "show up" through the fog of the stereotype. What have others done? What has worked before? ✓ Think playfully. ✓ Participate in more personal settings and situations where you can contribute. ✓ Seek out or bring along allies when you can
Cultivate Compassion…	✓ Be kind to yourself when you are hurt. Stereotyping hurts no matter how strong your defenses are. ✓ Remember we all are prone to stereotyping. Try to stay in touch with the other's humanity. ✓ Try not to stereotype them back. ✓ Heal with infusions of playfulness, righteous anger, passion, and humility
Create New Culture…	✓ Bond with other people who support your identity. ✓ Evoke them in your mind and let them be present with you. ✓ Be an activist! Do things that make you feel empowered. Take credit for artfully fighting the stereotype. ✓ Create new culture with your words, pictures, and deeds
Study History	✓ Research resistance to oppression in all its forms. ✓ Feel connected to all the humans who came before who created new culture for you. ✓ Think about the people who will benefit in the future from your actions now

STEREOTYPE MANAGEMENT SKILLS

For each of the skills below, cite examples in your life and action steps that you will implement in your life for growth and to further develop self-advocacy and promote social justice:

STUDENT SELF ADVOCACY

It means speaking up for yourself and communicating what you need to others. It involves knowing your strengths and weaknesses, knowing what your rights are and effectively communicating through speaking and listening, knowing yourself, knowing your needs, and knowing how to get what you need. It requires you to Believe in Yourself; you are a unique and valuable person. ...

BELIEVE IN YOURSELF!

Know Your Rights.	Gather Support...
Decide What You Want…	Target Efforts...
Clarify for yourself exactly what you need...	Express Yourself …
Get the Facts...	Assert Yourself …
Planning Strategy...	Be Firm and Consistent…
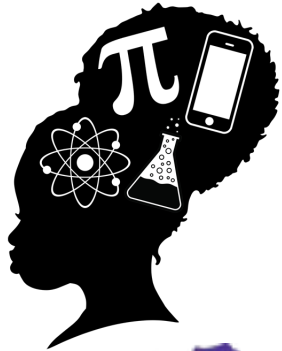
FIGHT OPPRESSION THROUGH STEM

FIGHT OPPRESSION THROUGH
STEM INNOVATION & ENTREPRENEURSHIP

USING YOUR VOICE TO FIGHT OPPRESSION
CANDID CONVERSATIONS!