PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

UCD School of Education
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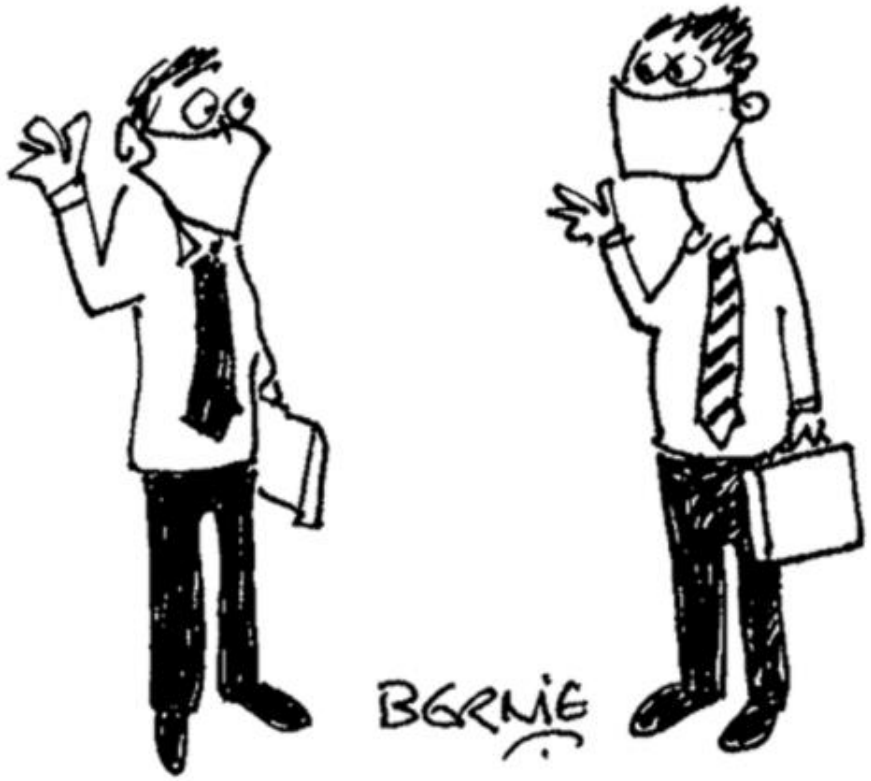
EDI in STEM: Changing mindsets and impacting sustainable futures in STEM Phase 1 - Focus on Girls in STEM

A deeper look at stereotyping and bias

Pleased to meet you!



'Pleased to meet you – always nice to put a face to a name.'

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SUSTAINABLE DEVELOPMENT GOALS

*An **implicit bias** is an **unconscious** association, belief, or attitude toward any social group.*
*Due to implicit biases, people may often attribute certain qualities or characteristics to all members of a particular group, a phenomenon known as **stereotyping.***

Such biases do not necessarily align with our own sense of self and personal identity.

How does the IAT work?

The IAT measures associations between concepts (e.g., Flowers and Insects) and evaluations (e.g., good, bad).

People are quicker to respond when items that are more closely related in their mind share the same button.

Studies that summarize data across many people find that the IAT predicts discrimination in hiring, education, healthcare, and law enforcement.

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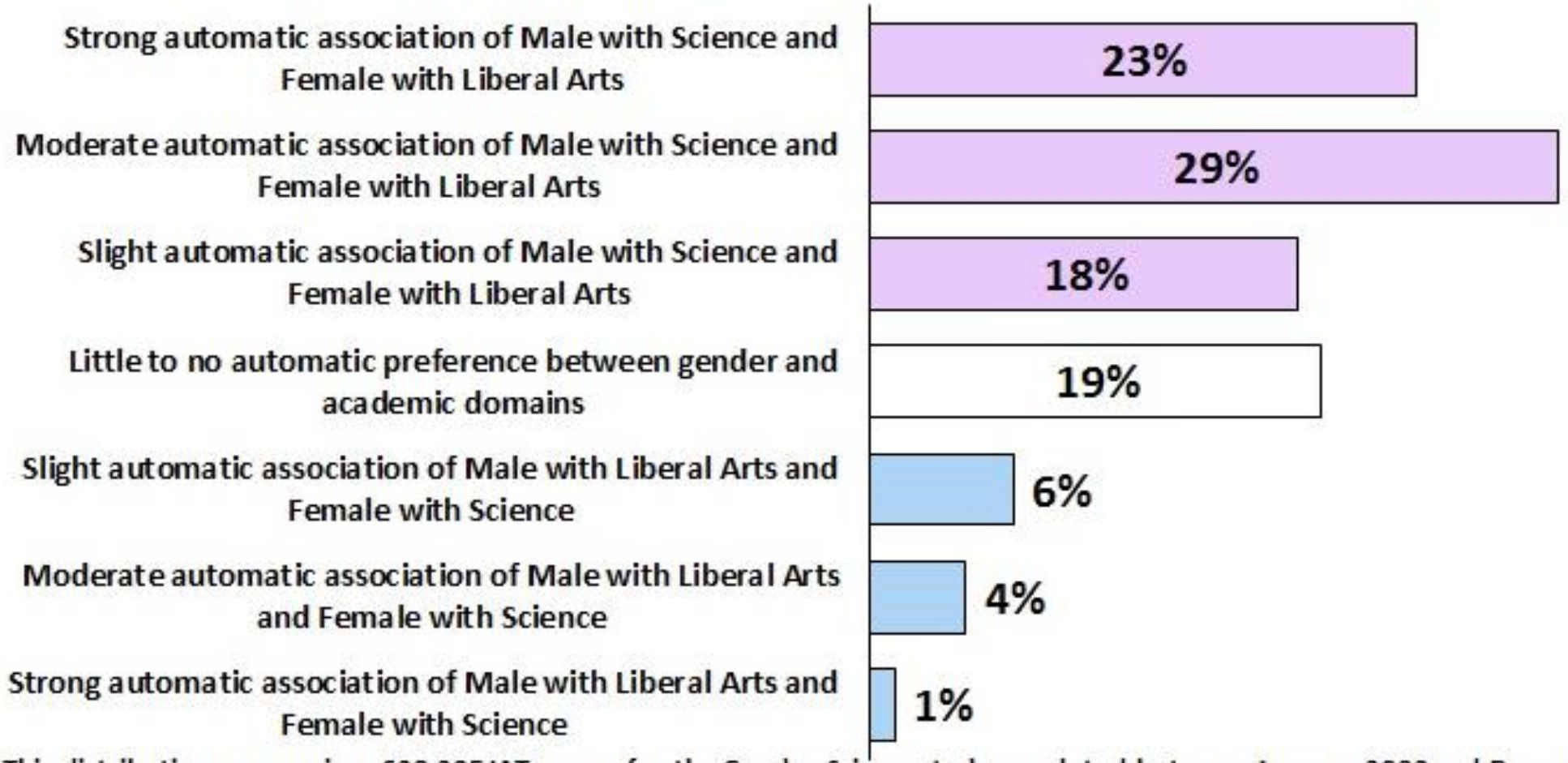
Percent of web respondents with each score



This distribution summarizes 628,295 IAT scores for the Gender-Science task completed between January 2003 and December 2015.

The Psychology Behind Implicit Bias

- **We tend to seek out patterns.** Our brain looks for patterns and associations in the world. **Social cognition**, or our ability to store, process, and apply information about people in social situations, is dependent on this ability to form associations about the world.

- **We like to take shortcuts**. Our brain tries to simplify the world. Because the brain is constantly inundated with more information than it could conceivably process, mental shortcuts make it faster and easier for the brain to sort through all of this data.

- **Our experience and social conditioning play a role**. Implicit biases are influenced by experiences, although these attitudes may not be the result of direct personal experience. Cultural conditioning, media portrayals, and upbringing can all contribute to the implicit associations that people form about the members of other social groups.

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Stereotype Threat – Girls and STEM

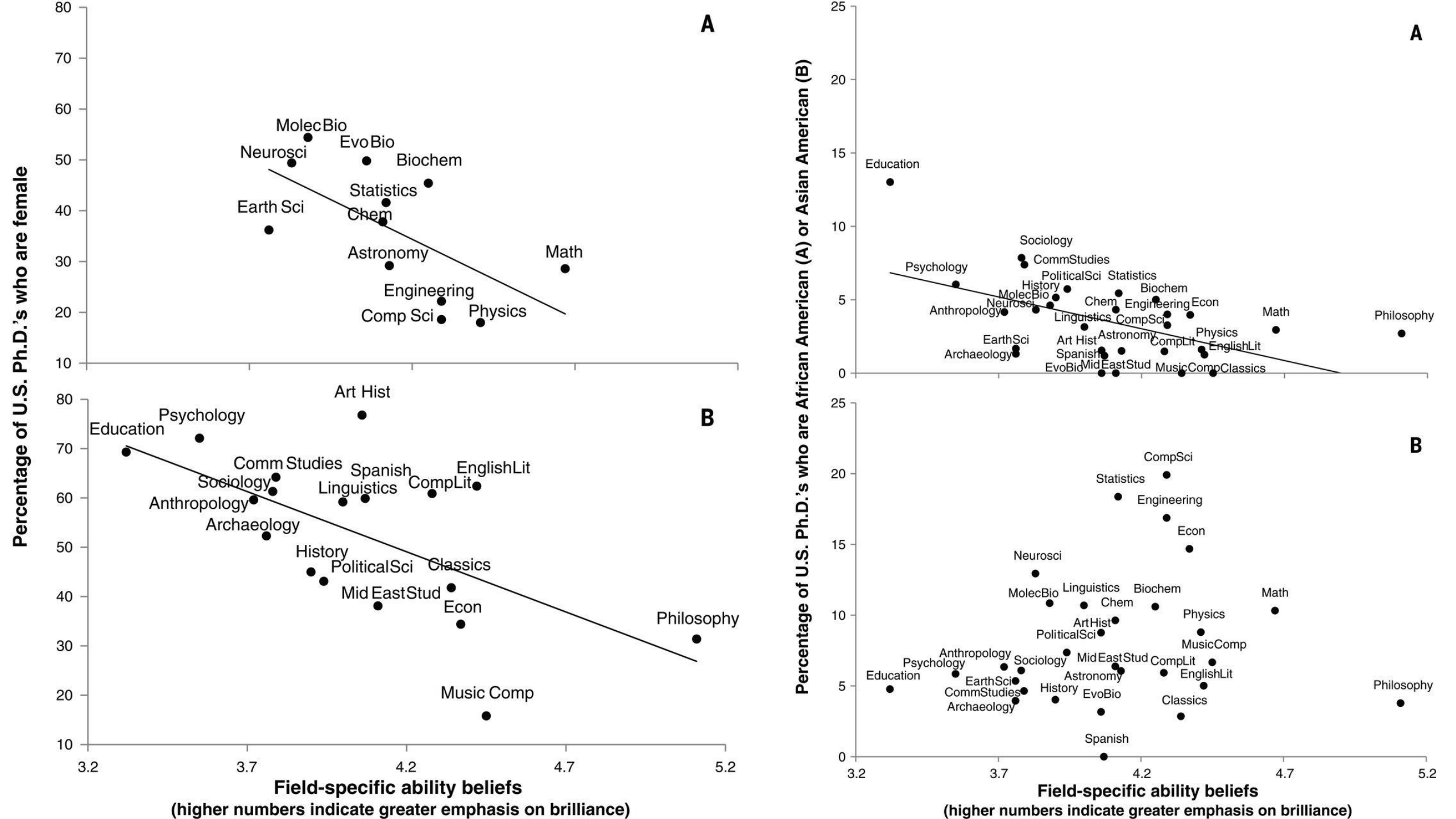
Stereotype threat: people internalize negative stereotypes about themselves based upon group associations.

Example:

By the age of 9, girls have been shown to exhibit the unconscious beliefs that females have a preference for language over maths. The stronger these implicit beliefs are, the less likely girls and women are to pursue maths performance in school.*

Consider what is happening in this experiment in terms of bias.

Girl toys vs boy toys: The experiment - BBC Stories


A
MolecBio
EvoBio
Neurosci
Biochem
Statistics
Earth Sci
Chem
Astronomy
Math
Engineering
Comp Sci
Physics
B
Art Hist
Psychology
Education
Comm Studies
Spanish
EnglishLit
Sociology
Linguistics
CompLit
Anthropology
Archaeology
History
PoliticalSci
Classics
Mid East Stud
Econ
Philosophy
Music Comp
Percentage of U.S. Ph.D.'s who are female
Field-specific ability beliefs
(higher numbers indicate greater emphasis on brilliance)
A
Education
Sociology
CommStudies
Psychology
PoliticalSci
Statistics
History
Biochem
MolecBio
Chem
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Econ
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Anthropology
Linguistics
CompSci
Math
Philosophy
Physics
EarthSci
Art Hist
Astronomy
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Archaeology
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EvoBio
Mid East Stud
MusicComp
Classics
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Neurosci
MolecBio
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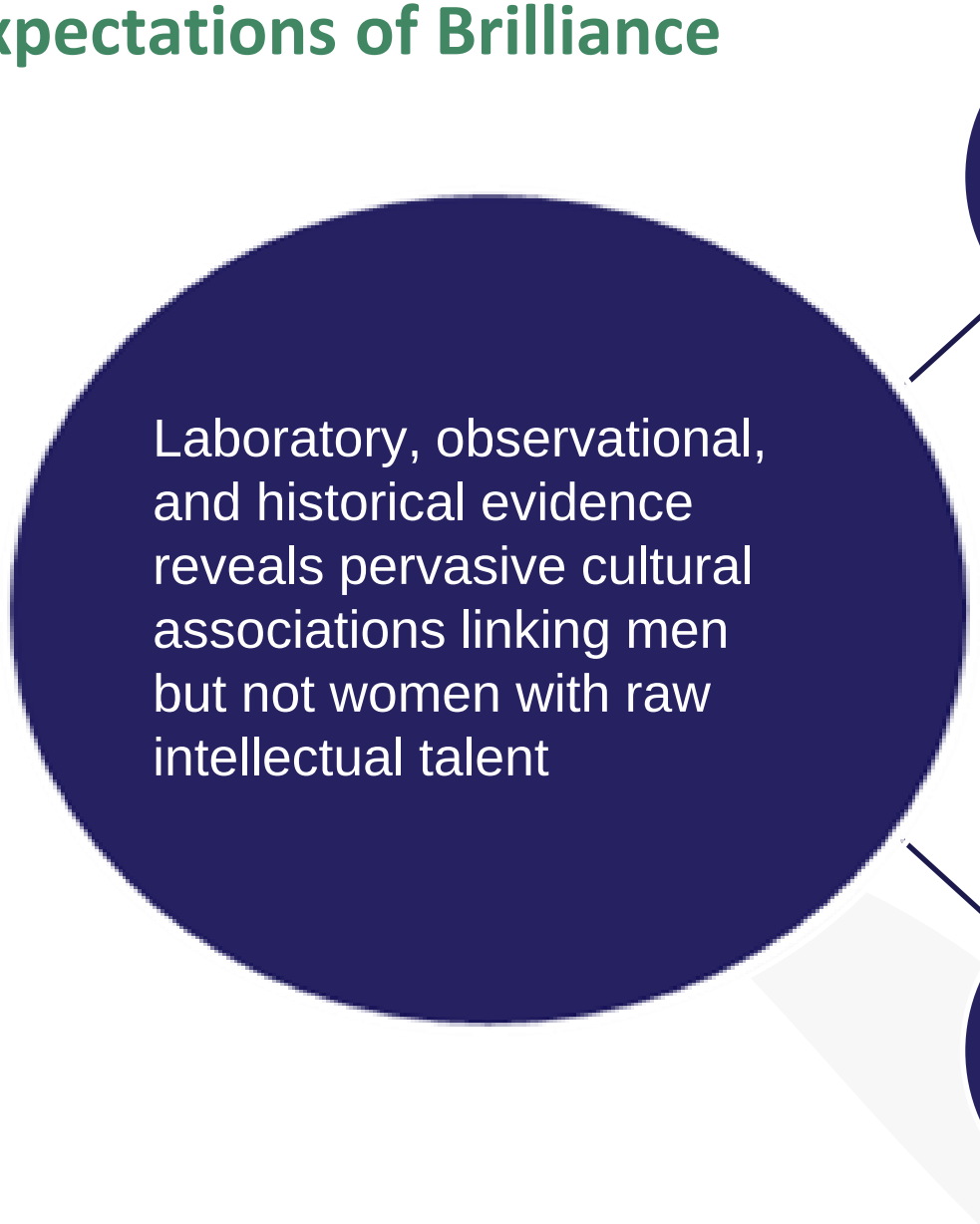
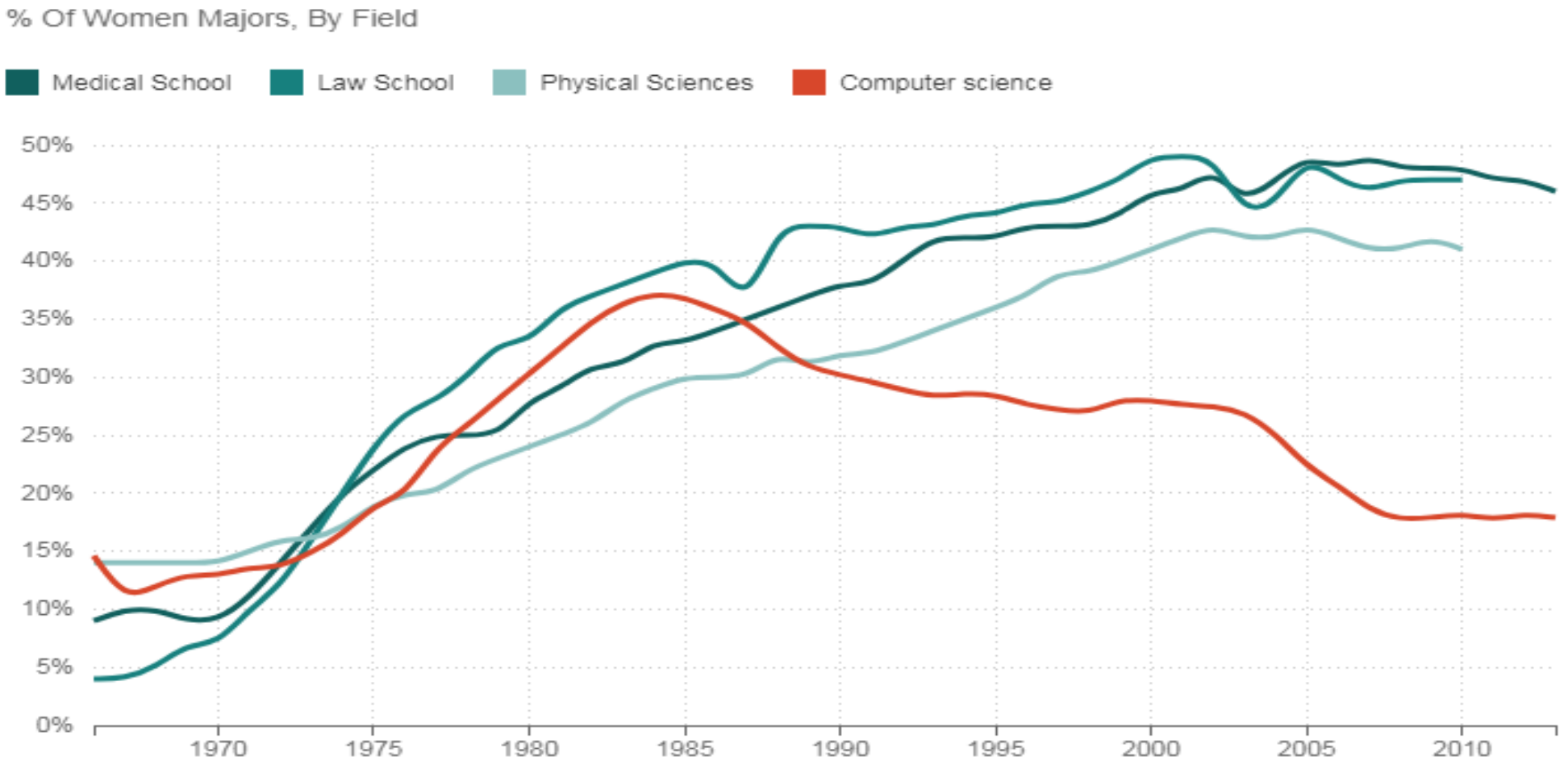
Biochem
Chem
Math
Physics
Art Hist
PoliticalSci
MusicComp
Anthropology
Psychology
Sociology
Mid East Stud
CompLit
Education
Astronomy
EnglishLit
EarthSci
CommStudies
History
EvoBio
Philosophy
Classics
Archaeology
Spanish
Percentage of U.S. Ph.D.'s who are African American (A) or Asian American (B)
Field-specific ability beliefs
(higher numbers indicate greater emphasis on brilliance)

Expectations of Brilliance



- The practitioners of disciplines that emphasize raw aptitude may doubt that women possess this sort of aptitude and may therefore exhibit biases against them.
- Emphasis on raw aptitude may activate the negative stereotypes in women's own minds
- Girls and women decide that these fields are not for them

What happened to women in computers?



Source: National Science Foundation, American Bar Association, American Association of Medical Colleges
Credit: Quoctrung Bui/NPR

What happened?

CODE: Debugging the Gender Gap Trailer

- Mid 1980s PCs appear in homes in significant numbers.
- Used mainly for gaming, they were marketed almost entirely towards boys.
- Families were more likely to buy computers for boys than for girls — even when their girls were really interested in computers. Frequently, the family PC was kept in the boys bedroom. (Margolis, 2001).
- This message that computers were “toys for boys” was echoed in movies like *Weird Science, Revenge of the Nerds* and *War Games* with the theme of “awkward boy genius” saves the day and gets the girl.

IF PERSONAL COM
ARE FOR EVERY
HOW COME THEY'R
FOR NOBOD

$1395* APPLE* IIe 64K

$999* TRS-80* III 16K

$1

A personal computer is supposed to be a computer for persons. Not just wealthy persons. Or wired persons. Or privileged persons.

But person persons.

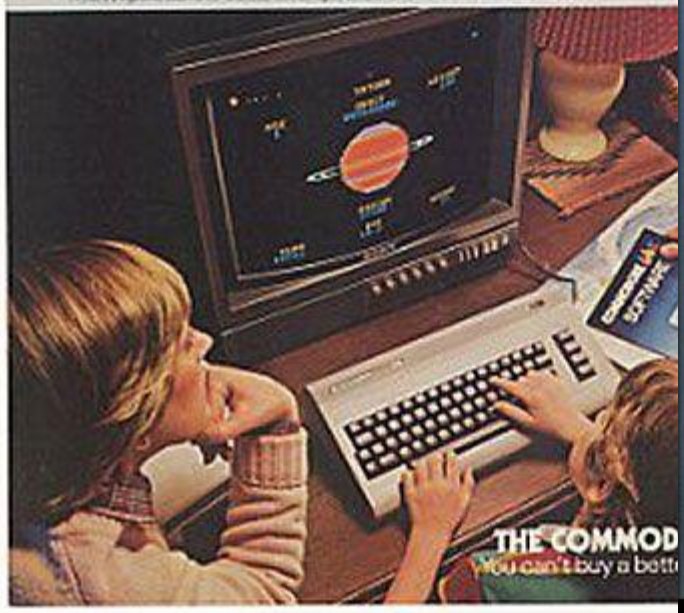
In other words, all the persons whom Apple, IBM, and Radio Shack seem to have forgotten about including, most likely, you.

But that's okay. Because now you can get a high-powered home computer without taking out a second mortgage on your home.

It's the Commodore 64. We're not talking about a low-priced computer that can barely retain a phone number. We're talking about a memory of 64K. Which means it can perform tasks most other home computers can't. Including some of those that cost a lot more. (Take another look at the three computers above.)

By itself, the Commodore 64 is all the computer you'll ever need. Yet, if you do want to expand its capabilities some day, you can do so by adding a full complement of Commodore peripherals. Such as disk drives. Modems. And printers.

You can also play terrific games on the Commodore 64. Many of which



THE COMMOD
You can't buy a bett

A Beautiful Way To Interface

IQ 140

SOROC's first and foremost concern, to design outstanding remote video displays, has resulted in the development of the IQ 140. This unit reflects exquisite appearance and performance capabilities unequaled by others on the market.

With the IQ 140, the operator is given full command over data being processed by means of a wide variety of edit, video, and mode control keys, etc.

The detachable keyboard, with its complement of 117 keys, is logically arranged into 6 sections plus main keyboard to aid in the overall convenience of operation. For example, a group of 8 keys for cursor control / 14 keys accommodate numeric entry / 16 special function keys allow access to 32 pre-programmed commands / 8 keys make up the extensive edit and clear section / 8 keys for video set up and mode control / and 8 keys control message and print.

Two Polling options available: 1) Polling compatible with Lear Siegler's ADM-2. 2) Polling discipline compatible with Burroughs.

IQ 120

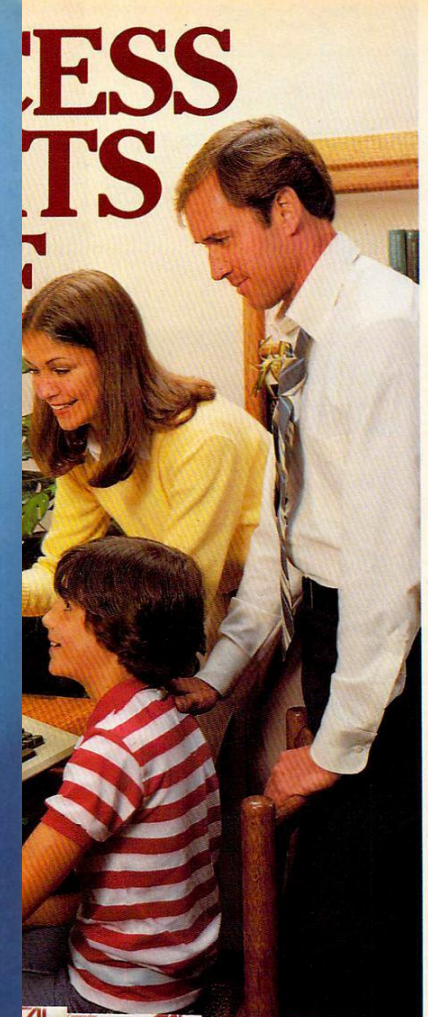
The SOROC IQ 120 is the result of an industry-wide demand for a capable remote video display terminal which provides a multiple of features at a low affordable price. The IQ 120 terminal is a simple self-contained, operator / computer unit.

The IQ 120 offers such features as: 1920 character screen memory, lower case, RS232C extension, switch selectable transmission rates from 75 to 19,200 bps, cursor control, addressable cursor, erase functions and protect mode. Expansion options presently available are: block mode and hard copy capability with printer interface. The IQ 120 terminal incorporates a 12-inch, CRT formatted to display 24 lines with 80 characters per line.

Circle 346 on inquiry card.

SOROC TECHNOLOGY, INC.

165 FREEDOM AVE., ANAHEIM, CALIF. 92801
(714) 992-2860 / (800) 854-0147



The day you bring your first CAI™ learning game home and watch your child play, you'll know the excitement of a winning choice.

Active Family

Your family and CAI's growing family of animated, full-color programs have a lot to share —beginning with a willingness to reach beyond the ordinary to achieve the best.

At Your Command

You may meet a princess, a juggler or a dragon in *Wizard of Words.*™ You may appear as a guest on TV in *Master Match,*™ *The Game Show*™ or *Tic Tac Show.*™ Or, you may extend these programs still further with our *LearningWare*™ diskettes, offering hundreds of questions matched to the teaching strategies in the games. In every case, CAI puts a world of imagination and learning at your fingertips. And puts you and your child in control.

Unique Approach

Key features place CAI thinking tools in a class by themselves: Each program comes with its own *library of subjects.* But that's just the start. Our unique *authoring system* let's you or your child create your own lessons on any topic, tailoring the program to your family's needs —and no computer knowledge is required. Add the fact that we've kept the vital ingredient –*FUN*– in learning, and our *proven success* is no surprise. Over 2,000 school districts now use CAI programs to teach essential vocabulary and logic skills in a variety of subject areas.

CAI supports its products —and you —with an unconditional guarantee and a free backup disk. And provides compatibility with the most popular computers: Apple,® IBM® (and soon Commodore™).

Wise Choice

CAI is a group of experienced educators and programmers who believe that success begins with opportunities you create at home. Ask to see a demonstration of CAI programs at your local computer store, and see for yourself just how rewarding a good education can be.

Computer Advanced Ideas CAI™

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The Matilda Effect

"It is important to note early that women's historically subordinate 'place,' in science (and thus their invisibility to even experienced historians of science) was not a coincidence and was not due to any lack of merit on their part, it was due to the camouflage intentionally placed over their presence in science." M Rossiter

The Gender-Equality Paradox

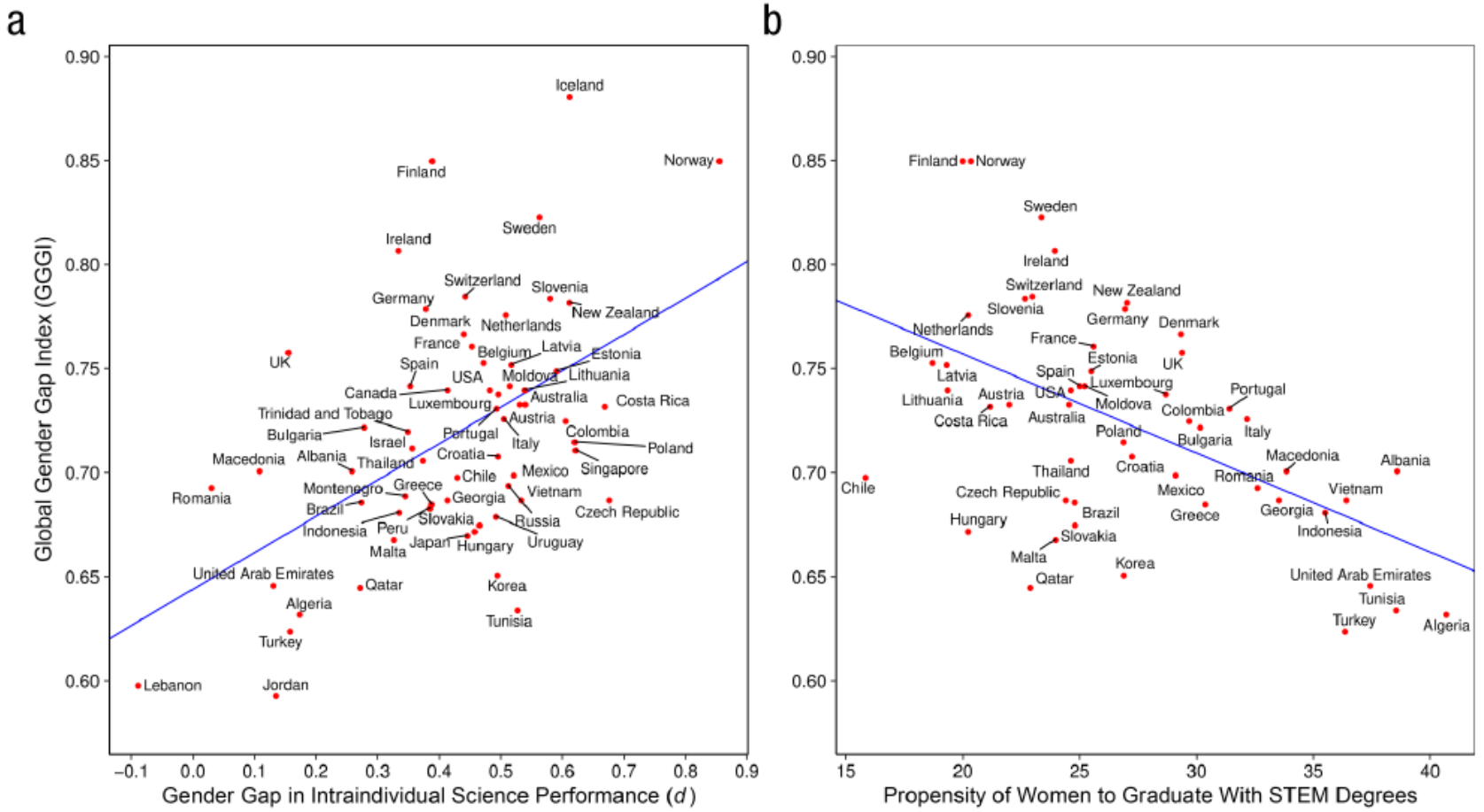

Fig. 3. Scatterplots (with best-fitting regression lines) showing the relation between gender equality and sex differences in (a) intraindividual science performance and (b) the propensity of women relative to men to graduate with science, technology, engineering, and math (STEM) degrees. Gender equality was measured with the Global Gender Gap Index (GGGI), which assesses the extent to which economic, educational, health, and political opportunities are equal for women and men. The gender gap in intraindividual science scores (a) was larger in more gender-equal countries ($rs = .42$). The propensity of women relative to men to graduate with STEM degrees (b) was lower in more gender-equal countries ($rs = -.47$).

Countries with lower levels of gender equality had relatively more women among STEM graduates than more gender-equal countries.

This is a paradox, because gender-equal countries are those that give girls and women more educational and empowerment opportunities and that generally promote girls' and women's engagement in STEM fields.

Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in science, technology, engineering, and mathematics education. *Psychological Science*, 29, 581–593. doi:10.1177/0956797617741719

What causes the Gender-Paradox Effect?

- The stereotype associating math to men is stronger in more egalitarian and developed countries (Breda et al, 2020)
- When boys are relatively better in science and mathematics and girls are relatively better at reading than other academic areas, there is the potential for substantive sex differences to emerge in STEM-related educational pathways.
- The processes that exaggerate sex differences are overridden in less gender equal countries. One potential reason is that a well-paying STEM career may appear to be an investment in a more secure future.
- If absolute performance, interest, joy, and self efficacy alone were the basis for choosing a STEM career, we would expect to see more women entering STEM career paths than do so.

Stoet & Geary, (2018).

How to Reduce Implicit Bias

- **Focus on the individual**. Rather than focusing on stereotypes to define people, consider them on a more personal, individual level.
- **Challenge your stereotypes**. If you do recognize that your response to a person might be rooted in biases or stereotypes, make an effort to consciously adjust your response.
- **Reflect**. In order to reduce reflexive reactions, take time to reflect on potential biases and replace them with positive examples of the stereotyped group.
- **Empathy**. Try seeing things from another person's point of view. How would you respond if you were in the same position? What factors might contribute to how a person acts in a particular setting or situation?
- **Increase your exposure**. Spend more time with people of different racial backgrounds. Learn about their culture by attending community events or exhibits.
- **Mindfulness**. Try meditation, yoga, or focused breathing to increase mindfulness and become more aware of your thoughts and actions.

www.verywellmind.com

Intervention
Investigating Heroines in STEM: Past & present, local and international as an integral part of teaching the curriculum……

Story Telling

Storytelling is being advocated as the methodology for this project in order to access and appreciate the lives, experiences, impact and contributions of women working in STEM and to inspire students to map “My STEM Journey”

Emotional Bond with Role Models

Students will be encouraged to connect with women working in STEM today.

Correspondence via email, guest appearances via zoom, podcasts etc.

“Women on Walls”

Field trips and guest speaker when possible

STEM Careers & Contributions to Society

By exploring the stories of women in STEM and making an emotional bond, students will become more aware of the career opportunities that exist in STEM in Ireland and abroad and the contribution STEM makes to society and the students’ own lived experience.