## Engendering Success in STEM

Evidence-based solutions for reducing the effects of implicit gender bias

<sup>¶</sup>gender<sub>∰</sub> economy



**ENGENDERING SUCCESS IN STEM** 

#### **ENGENDERING SUCCESS IN STEM**

**Engendering Success in STEM (ESS)** is a research partnership of social scientists, STEM experts, and stakeholders in STEM industries and education, united by the shared goal of fostering gender inclusion and success in STEM (Science, Technology, Engineering, and Math). We use an evidencebased approach to break down the biases girls and women face on their pathway to success in STEM.

Applying two decades of research, our team tests interventions that harness the power of positive social interactions to reduce the effects of implicit gender bias. These interventions target the distinct obstacles that are unique to each step along the path from early education to industry.

ESS and the Institute for Gender and the Economy (GATE) are excited to co-host the capstone knowledge-sharing conference of **ESS: Breaking Barriers and Building Bridges (BBBB).** The event brings together leaders from academia, industry, and government to generate new ideas and deepen existing collaborations for evidence-based interventions to promote gender inclusion in STEM.











Social Sciences and Humanities Research Council of Canada Conseil de recherches en sciences humaines du Canada



## Engendering Success in STEM

Evidence-based solutions for reducing the effects of implicit gender bias



#### Engendering Success in STEM: Evidence-based solutions for reducing the effects of implicit gender bias

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## FOREWORD

#### Dr. Toni Schmader

ESS Director and Professor of Psychology, University of British Columbia

Our world is built and understood by engineers and scientists. These are the fields that create the innovation, infrastructure, and information that structure our everyday lives, fuel the economy, and work toward solutions to some of our biggest challenges. And yet, in certain STEM fields – such as engineering and computer science -- women continue to be underrepresented both due to lower rates of attraction and higher rates of attrition.

An enduring obstacle to girls' and women's full participation and success in STEM is the tendency to **think science, think male**, an implicit cognitive bias embedded in our broader cultural norms and beliefs about what men and women do best. The tendency to associate STEM more with men than women can impede girls' and women's advancement in STEM both by affecting how they are treated by others, the degree to which STEM environments feel welcoming and inclusive, and by undermining their own ability to imagine themselves in STEM careers.

Girls/Women:	I can imagine	I choose to get the	I perform well and	I am committed to and
	myself in STEM	skills for STEM	choose a STEM career	successful in my career
Boys/Men:	I can envision girls in STEM	l respect girls' skills for STEM	l accept and support women in STEM	I understand bias and
	Use role models to	Change boys' biases	Equip men and women	Create identity-safe
	change STEM biases	and girls' fit to STEM	with supportive coping to	interactions to foster
	and self-beliefs	to change behavior.	combat bias and threat.	a sense of inclusion.
	Key Obstacle:	Key Obstacle:	Key Obstacle:	Key Obstacle:
	Developing Gender Bias	Lack of Perceived Fit	Stereotype Threat	Culture of Exclusion
	<b>Elementary School</b>	<b>High School</b>	University	Workplace

With generous support from the **Social Sciences and Humanities Research Council (SSHRC)** and over two dozen educational and industry partners, **Engendering Success in STEM (ESS)** brings together social scientists with expertise in social, developmental, and organizational psychology with STEM outreach experts to carry out and mobilize field-based research on gender inclusion in STEM. Working in four research teams (Projects CLIMB, PRISM, SINC and RISE), our work seeks to create innovative and evidenced-based best practices for increasing girls' and women's participation and success in STEM along their pathway of education, training, and professionalization. In this booklet, we provide a series of white papers created through the collaborative work of **ESS** and some of its partnering organizations including the **Institute for Gender and the Economy (GATE)**, **WWEST**, the **Association of Consulting Engineering Companies**, **British Columbia**, and **Engendering Engineering Success**, the precursor to ESS. These white papers explain the negative effects of implicit bias for both children and adults and strategies for fostering inclusion in educational and organizational contexts. A set of papers then summarizes other organizational best practices for achieving greater gender diversity. Finally, we end with targeted advice for increasing everyday allyship behaviour that both counteracts bias and fosters greater inclusion. As parents, educators, managers, and organizational leaders, we can co-create cultures of inclusion with the help of this shared knowledge.

## ACKNOWLEDGEMENTS

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## Implicit Biases in STEM: Negative Effects for Children and Adults

The underrepresentation of women in certain STEM fields leads to an implicit tendency to associate STEM more with men than women. The following set of white papers reveals how these implicit gender stereotypes can affect both children and adults in subtle but profound ways. 'Implicit Gender Stereotypes in Engineering' first clarifies the distinction between implicit and explicit gender stereotypes and how each can cloud judgement and hinder equal opportunities for women's advancement in STEM. Implicit gender stereotypes about STEM form early in childhood, as highlighted in 'Development of Implicit Gender Stereotypes.' This white paper features some work by ESS Project CLIMB that demonstrates how early development of implicit STEM stereotypes can prevent young girls from developing a STEM identity and disrupt their performance in STEM contexts. This latter effect is explored in more detail in 'Stereotype Threat,' which describes how subtle reminders of negative stereotypes impair a person's ability to perform up to their potential. But such stereotypes not only affect how girls and women see themselves; they can also lead to biased treatment. 'Unconscious Bias' provides evidence that more negative perceptions of women in STEM can impair their career opportunities. Finally, 'Does Implicit Bias Affect Hiring in Science?' features research by ESS Project RISE that examines these effects on women's promotion into academic science positions. Collectively, these papers underscore the pervasive and detrimental influence of implicit Bias in STEM, underscoring the need for proactive measures across academic and professional contexts.

## **⊿EES**

## Implicit Gender Stereotypes in Engineering

#### **Explicit & Implicit Stereotypes**

**Explicit stereotypes** or attitudes are opinions that people consciously think about and assess. These can be shared verbally.

Implicit stereotypes<sup>1</sup> are automatic and involuntary associations that people make between a social group (i.e. "men") and a domain or attribute (i.e. "science" or "math").

A person can have different implicit and explicit stereotypes. For example, one can have conscious beliefs that men and women are equally capable engineers, yet may automatically associate engineering more with men than women. The implicit association of men with math or science is different than sexism, or explicit stereotypes about women's abilities, as implicit associations are unconscious and automatic.

#### **In Summary**

Working female engineering feel less committed to their job and less valued by their organization compared to their male counterparts.

Our results suggest that these gender differences could be tied to prevalent implicit gender stereotypes - associating engineering more with men than women - that working engineers tend to show regardless of their gender. A similar pattern could also exist between feeling valued by one's organization and implicit stereotypes.

Since these findings are correlational, it is difficult to infer causation. Future research needs to explore how exactly implicit gender stereotypes might impact working female engineers.

#### Employment Experiences Study

Women are underrepresented among working engineers<sup>2</sup>. In this study, we explored how the experience of working as an engineer differs for men and women. We studied professional engineers (263 in total: 145 women, 118 men) who work in engineering companies across North America. All participants were trained and employed as engineers.

#### Implicit Gender Stereotypes & Engineering

Our findings:

On average, people of all genders **associated engineering** more **with men** than women.



stereotypes are strong, women are less committed to their job than men.

When implicit stereotypes are weak, men and women are equally committed to their job.



This study asks how widespread ideas about **gender** and **engineering** relate to women being more likely than men to drop out of engineering<sup>5,6,7</sup>.

#### How Implicit Stereotypes Are Measured

The Brief Implicit Attitude Test<sup>4</sup> (bIAT) measures implicit stereotypes and biases.

Words flash on a computer screen. Participants quickly decide whether or not each word fits into one of two categories presented on the screen.



When people have a strong implicit bias, they are faster to categorize science and math words along with words related to men but not women.

When people have no implicit bias, its just as easy for them to categorize science and math words with "women" or "men."

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#### **Engendering Engineering Success**



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#### **About Engendering Engineering Success (EES)**

EES is a joint research project between the University of Alberta, the University of British Columbia, and the University of Guelph. We aim to identify which organizational practices best predict an inclusive and supportive workplace culture that maximizes organizational commitment and productivity for both men and women.

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## **The Development of Implicit Gender Stereotypes**



#### Implicit stereotypes are automatic and involuntary associations that people make

between a social group (i.e. "boys") and an activity (i.e. "science" or "math")



By age **six**, North American **children** have implicit stereotypes associating math more strongly with boys than girls.<sup>2</sup>

countries.3,4,5



## **Effect on Math Self-Concept**

Math self-concept is the degree to which children identify with math (e.g. math = me).

It can predict children's math achievement<sup>8</sup> and interest.9

The more girls associate math with boys, the weaker their implicit math self-concept.<sup>3</sup>



It is important to combat these stereotypes in order to help girls to develop a strong math self-concept.

## **Effect on Math Performance**

Girls perform worse on math assessments when they are reminded of **gender** stereotypes by colouring a picture of:



girl incorrectly solving a math **problem** instead of a picture of a **boy** correctly solving th

ender by colouring a **girl** instead of a \_\_\_\_\_\_ landscape<sup>®</sup>



These studies show that it is **imperative** to break this negative cycle of stereotypes undermining girls' math performance.

## Implications

It is important to change these **stereotypes** as early in development as possible to help prevent girls from **underperforming** in and **disidentifying** with math in early elementary school.

Early math abilities form the foundation for later math skills and interest. To encourage more girls to enter math-related fields like engineering or computer science, caregivers and educators need to ensure they start their math careers on an equal footing to boys.

WATERLOO



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## The Development of Implicit Gender Stereotypes

ENGENDERING SUCCESS IN STEM

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## About Project CLIMB 🖸

How can we best teach young children that girls as well as boys can be good at math and science? Project CLIMB (Changing early learning of implicit math biases) tests programs that counteract early learning of implicit gender bias. Grades 2-7 are an important period for acquiring foundational math and science skills. Exposing kids to positive role models can change these biases and boost girls' math performance, without adversely affecting boys. Project CLIMB will test the impact of long-term contact with positive role models on girls' STEM engagement. Working with community partners, we will identify several interventions that are effective in changing gender bias and susceptibility to stereotype threat among boys and girls aged 7-12.

Learn more at: http://successinstem.ca/projects/climb

## About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions. The shared goal of our research is to foster women's inclusion and success in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down the biases girls and women face on their pathway to success. Funded by the Social Sciences and Humanities Research Council.

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### **Stereotype Threat**

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#### **Recommended Readings**

- 1. http://www.reducingstereotypethreat.org/
- 2. Dr. Toni Schmader's website: http://schmader.psych.ubc.ca/research.html

#### About WWEST

Westcoast Women in Engineering, Science & Technology (WWEST) is the operating name for the NSERC Chair for Women in Science and Engineering (CWSE), BC and Yukon Region. Our mission is to advance engineering and science as welcoming careers that serve our world through holistic understanding and creative, appropriate and sustainable solutions. WWEST works locally and, in conjunction with the other CWSE Chairs, nationally on policy, research, advocacy, facilitation, and pilot programs that support women in science and engineering.

#### **About the Chairholder**

The Chair is held by Dr. Elizabeth Croft, P.Eng., FEC, FASME. Dr. Croft is the Associate Dean, Education and Professional Development in the Faculty of Applied Science, and a Professor of Mechanical Engineering at the University of British Columbia. She is also the Director of the Collaborative Advanced Robotics and Intelligent Systems (CARIS) Laboratory. Her research investigates how robotic systems can behave, and be perceived to behave, in a safe, predictable, and helpful manner. She is the lead investigator of "Engendering Engineering Success," a 3-year interdisciplinary research project that aims to take an evidence-based approach to increasing the retention of women in engineering by understanding and changing aspects of workplace culture that place women at a disadvantage.

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### **Unconscious Bias**

Unconscious bias refers to the To be seen as equally "competent" by US science professors were asked to assumptions and conclusions we jump reviewers, female researchers need to publish: evaluate a CV for a lab manager: <sup>2</sup> to without thinking.1 3 more \$30,238.10 20 more An example might be assuming that articles in articles in an older person walking with a child OR *Nature* or specialist Science is their grandparent. These biases do journals not indicate hostility towards certain groups; they reflect how the individual than male applicants when applying for a ~ has been socialized. medical fellowship.<sup>5</sup> The male candidate was offered a higher salary... Several studies demonstrate the impact unconscious bias can have on "We would have to see her job talk" the hiring process, particularly for women. "I would need to see evidence that she had ... more mentorship *qotten these grants and* publications on her own" Try the Implicit Bias test: Psychology professors reviewing https://implicit. identical CVs were **4x** more likely These biases may not be intentional, harvard.edu/ to write cautionary comments but their impact is severe. The ... and was rated more "competent" for female applicants.<sup>4</sup> effects of unconscious bias will not be and "hireable."  $\Sigma\Sigma\Sigma$ overcome by maintaining our current efforts to recruit and retain 2 **∂** more women.<sup>2</sup> Reference letters for female medical faculty CV CV were **shorter**, more **vague**, and placed **less** The catch? Other than the names at To reduce unconscious bias in hiring, emphasis on research than those for males.<sup>6</sup> the top, the CVs were **identical**.<sup>2</sup> committees and individuals need to Percentage of letters that contained the phrase: be educated about its existence and "compassionate" effects in academia and industry. or "relates well with patients/staff "accomplishment" Online tools such as the Harvard Women are 50% and "achievement" 9 Implicit Association Test can help more likely to identify an individual's unconscious "successful" 2 advance in an biases. Sharing research and becoming orchestra audition if aware of your organisation's hiring The average letter length for women was 227 they can't be seen.3 tendencies can also help reduce words, compared to 253 words for men.6 unconscious discrimination.

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Westcoast Women in Engineering, Science & Technology



Chairs for Women in Science and Engineering Chaires pour les femmes en sciences et en génie

#### **WWEST**

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#### About WWEST

Westcoast Women in Engineering, Science & Technology (WWEST) is the operating name for the NSERC Chair for Women in Science and Engineering (CWSE), BC and Yukon Region. Our mission is to advance engineering and science as welcoming careers that serve our world through holistic understanding and creative, appropriate and sustainable solutions. WWEST works locally and, in conjunction with the other CWSE Chairs, nationally on policy, research, advocacy, facilitation, and pilot programs that support women in science and engineering.

#### About the Chairholder

The Chair is held by Dr. Elizabeth Croft, P.Eng., FEC, FASME. Dr. Croft is the Associate Dean, Education and Professional Development in the Faculty of Applied Science, and a Professor of Mechanical Engineering at the University of British Columbia. She is also the Director of the Collaborative Advanced Robotics and Intelligent Systems (CARIS) Laboratory. Her research investigates how robotic systems can behave, and be perceived to behave, in a safe, predictable, and helpful manner. She is the lead investigator of "Engendering Engineering Success," a 3-year interdisciplinary research project that aims to take an evidence-based approach to increasing the retention of women in engineering by understanding and changing aspects of workplace culture that place women at a disadvantage.

#### Thank you to our sponsors

Lead Sponsors: UBC Faculty of Applied Science, BC Hydro, Dr. Ken Spencer, WorleyParsons Canada Ltd., Teck Resources Limited, Stantec Consulting, and Henry F. Man. Contributing Sponsors: Ms. Catherine Roome, Mr. Stanley Cowdell, Division for the Advancement of Women in Engineering and Geoscience, Nemetz (S/A) & Associates Ltd., and Glotman Simpson Consulting Engineers.

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## Does Implicit Bias Affect Hiring in Science?



The **under-representation** of women in science, technology, engineering, and math (STEM) is well documented.<sup>1,2,3</sup>

There is a debate about whether **implicit bias** plays a role in hiring.



## **Implicit Bias**

occurs when **stereotypes** that are **automatically activated** bias outcomes.<sup>5-6</sup>

A common **automatic association** is between **science and men**.<sup>7-9</sup> It can be linked to differences in performance<sup>7</sup> and participation<sup>10</sup> rates in STEM. Can it bias decision-making in real-world hiring contexts?



These associations sometimes bias decisions, and sometimes do not.<sup>11</sup> Because of this, they are especially important to examine in decision-makers.<sup>11</sup>

## Explicit Beliefs About Bias

People sometimes feel justified in letting their implicit stereotypes bias their decisions.<sup>11</sup>

If they believe bias isn't a problem, they might not suppress their implicit stereotypes.

Implicit stereotypes can be justified by a person's explicit beliefs,<sup>12,13</sup> which can help us:

control the effect Or of implicit bias on behavior increase their impact if a person believes their actions are rational or objective.<sup>14</sup>

## **Hiring Committee Study**

Do implicit stereotypes and explicit beliefs predict hiring outcomes for women in a real world STEM context?

**39 committees** hiring elite research positions were tested over 2 years for their **implicit stereotypes**, **explicit beliefs**, and **selection outcomes**.<sup>11</sup>

This study measured the committee average of the following biases:

Implicit stereotypes

science=male association do wome

**Explicit beliefs about biases**: do women face external barriers to their success (e.g. discrimination)?

Explicit awareness that women face barriers to success



Implicit stereotypes Biased hiring decisions

Group norms may affect how much stereotypes are acknowledged, set aside, or justified.

Half of the committees did not believe gender bias is a problem.<sup>11</sup>

## Habit-Breaking Interventions<sup>6</sup>



make decision-

makers aware of

implicit biases



provide effective strategies for reducing impact of implicit biases understand the consequences of implicit biases

To have a greater effect, **education strategies** should be paired with strong **accountability** measures.

Learn more about implicit bias, what you can do to combat it, and our research in our white paper series on our website: successinstem.ca

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## Does Implicit Bias Affect Hiring in Science?



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## About Project RISE ᄋ

How can we educate adults about implicit bias in a way that fosters mutual respect and creates a more inclusive culture in the workplace? Project RISE (Realizing Identity-Safe Environments) will harness our understanding of implicit bias, intergroup contact, and social identity threat to create a more "identity safe" workplace culture. Interventions designed to create identity-safe contexts have been shown to narrow the gender gap in academic performance. Project RISE aims to create positive cultural change for women and men in science and engineering by: (1) educating participants about implicit bias, (2) fostering supportive and respectful interactions between men and women in the organization, and (3) providing them with a clear understanding for how to combat bias. Learn more at: successinstem.ca/projects/rise/

## About Engendering Success in STEM (ESS)

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## Postering Fit and Inclusion in STEM Education

Given the pervasiveness of implicit gender stereotypes, it's important to understand how the tendency to associate STEM more with men than women creates STEM environments that exclude girls and women. This collection of papers delves into the challenges and solutions for enhancing inclusivity and identity fit in STEM education. In 'Gender Inclusion and Fit in STEM,' Project RISE research reveals that women's underrepresentation in STEM can be traced to their perceived lack of fit, inclusion, and belonging. 'Designing Gender Inclusive STEM Classrooms' harnesses this information to provide practical advice that educators can use to create more inclusive classrooms. 'Role Models in STEM' underscores the importance applying narratives about positive role models from diverse backgrounds to inspire and reshape preconceived notions. Two white papers then describe how ESS Project PRISM has tested proactive role model interventions in summer science camps to 'Reduce Boys' Gender Bias and Improve Girls' Anticipated Fit in STEM.' Finally, a white paper on 'Intersectionality in STEM' describes how women of colour often experience unique biases and challenges that further impair their ability to succeed. Ultimately, this set of papers champions the need to make STEM educational environments more inclusive not only for women, but also for members of other underrepresented groups.

## **Gender Inclusion & Fit** in STEM



Why do gender disparities persist<sup>2-4</sup> in STEM despite women's\* increased involvement & interest? \*Gender identities go beyond the binary that most research protrays; women with marginalized identities also face barriers that are similar but distinct **Root causes of STEM attrition** People's perceptions (self & others' Many women might self-select out of STEM because the environment does not fit1 Stereotypes Preferences (activities & values) Expressing one's true self (state authenticity<sup>14</sup>) is a key influence: motivator to attract, engage & retain people in a field, as people tend to prioritize careers that are a good fit<sup>5</sup> Pursuits (of different careers) Gender stereotypes can erode women's ability to feel Alone these can be seen as women's individual choices. a sense fit & belonging in a setting but aggregated **systemic issues arise** SAFE Model & Person-Environment Fit<sup>1</sup> State Women's & girls' interest & advancement Authenticity is a signal of one's in STEM is often a function of their ability Fit to the to feel a sense of fit in STEM environment **E**nvironment **Environmental characteristics** Do cues in the environment signal... Culturally prevalent gender stereotypes Self-concept fit? **Goal fit?** Social fit? Masculine Cross-gender Encouraging defaults<sup>8</sup> vs dominance vs identity threat vs. STEM pursuit gender neutral collaboration respect/acceptance & engagement Do I choose, persist, & thrive Person State authenticity (am I able to express myself?) 'in STEM? characteristics Do I have the ability, self-confidence & interest? This model can explain why people opt out of some settings to self-segregate into others, even without sign of clear bias or discrimination How environments signal fit in STEM Self-concept fit Goal fit Social fit Can I express & be my authentic self here? Does this fit my career goals? My values?10 What does it feel like to work here? Encourage interactions that are Frame work in terms of collaboration, De-emphasize the focus on brilliance<sup>5,6</sup> supportive & inclusive of women & instead of working on things & projects<sup>5</sup> in STEM fields, & decrease the presence of masculine default<sup>8</sup> in policies<sup>9</sup>,

Check institutional policies on how interactions, & communication to work is structured & rewarded; these combat gender stereotypes7-8 may appeal more to men than women people with marginalized identities<sup>11-12</sup> Demonstrate discussions where all are heard equally & not interrupted13

Overall, STEM environments can be a bad fit for women; women are not a bad fit for STEM environments. Dismantling systemic barriers needs a multifaceted, intersectional approach to change organizational & educational cultures.

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## **Gender Inclusion & Fit** *in STEM*



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## Designing Gender-Inclusive STEM Classes

Include Women's Stories &

Histories in Curriculum<sup>6,7</sup>

Some girls never consider STEM as a potential career. Here are some ways to make your STEM class more gender-inclusive.



## Designing Gender-Inclusive STEM Classes

ENGENDERING SUCCESSIN STEM

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### Resources

#### Bring Women Experts To Your Classroom:

- Request a Woman Scientist: <u>500womenscientists.org/request-</u> <u>a-scientist</u>
- Skype a Scientist: skypeascientist.com

#### Free Female STEM Role Model Posters

- Women You Should Know: womenyoushouldknow.net/ downloadable-stem-role-models-posters
- Beyond Curie:
- beyondcurie.com/march-forscience-posters
- US Department of Energy: <u>energy.gov/downloads/women</u> <u>-stem-posters-series-one</u>
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## About Project PRISM

How can we make STEM a more attractive and meaningful option for adolescent girls and boys alike? Project PRISM (Promoting Rising Inclusion and STEM Motivation) will establish best practices for boosting girls' belonging in STEM, while bolstering boys' respect for girls' abilities. To combat obstacles girls may face in pursuing a STEM career, Project PRISM will test interventions that: (1) change boys' beliefs about girls via implicit bias training and presenting real evidence that test scores underestimate girls' abilities, (2) expose girls to successful role models who share their values and preferences, and (3) encourage girls to identify with STEM by recognizing that a STEM career can help them accomplish some of their most cherished goals.

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## **Role Models in STEM**



#### Exposing students to role models is a popular intervention to support recruitment & retention of underrepresented groups in STEM<sup>1,2</sup>

- Why role models? Benefits include increasing:
- Students' academic & social sense of belonging8,9 STEM students' academic
- self-efficacy<sup>4,5,8,9</sup>

#### with STEM (benefits academic performance<sup>4</sup>)

#### For positive effects, highlight role models'15:

#### Competence & success

Role models highlight career options in STEM & when described as competent (not exceptional) can increase student motivation & performance<sup>15</sup>

Note: role models should **recognize challenges** including feelings of not belonging<sup>5,25</sup> to validate students' experiences

Students' personal identification



#### Meaningful similarities with students

Connect with students by sharing hobbies & values e.g., spending time with others, 8,32,33 & persisting through failures & challenges<sup>5,9,25,28,34</sup>

Attainable paths & success

Hearing how role models defy **stereotypes**<sup>11,21,27</sup> can lead to **higher** self-efficacy (e.g., "if she can do it, I can too"



## seen as too stereotypic<sup>8,16</sup>, it can **backfire**<sup>8,24</sup> & dissuade students & their interest in STEM

#### **Prioritize underrepresented groups<sup>15</sup>**

Underrepresented groups have a lack of role models<sup>30</sup> in STEM

Underrepresented role models can have positive effects on all students, & reduce students' stereotypes<sup>3</sup>

Role models from majority groups<sup>4,7,32</sup> can highlight stereotypes of STEM fields that make them unwelcoming18,26 This can be overcome if the role model can build other connections (e.g., contradicting STEM stereotypes<sup>8,33</sup>)



Emphasize hard work over brilliance<sup>6,27,28</sup> - brilliance is seen as unachievable

Black & Latina women tend to identify more with a role model who shares a racial/ethnic background than one of the same gender,<sup>7,8,4,14,30,36,37</sup> however this is not always the case<sup>15</sup>

> Note: avoid additional labour for by using videos or reading materials; they are just as effective<sup>15,</sup>



## **Role Models in STEM**



While there is no noticeable difference in the effects of a role model intervention based on student age<sup>15</sup>, there are some age-related aspects to consider when planning a role model experience or intervention.

#### Considerations for school-age (K-12)

#### Choose role models carefully

**Perceiving similarities** to a role model is important for this age<sup>11</sup>; students can be put off if they are **frightened** or **intimidated** by the role model<sup>24,40</sup>, or find them too **stereotypic**<sup>16,17,40,41</sup>

STEM professionals should talk about their work in **ageappropriate** & **interesting** ways<sup>2</sup>

#### Reflect on intended audience

High school internship programs tend to attract students who already have a high level of STEM interest<sup>46</sup>

Consider interventions that **target all students**. Role models can have the biggest effect on high achieving students<sup>21</sup> **After school programs, camps**<sup>47</sup>, **hands-on activities** in school<sup>43,48</sup> can have a wider reach



Girls & boys scored equally well
Boys' & girls' math self-efficacy

Boys outperformed girls
Students did not identify
as much with them

Attributing hard work to role models' success can increase their effect<sup>28</sup>

#### **Considerations for post-secondary** Role models can have **positive effects** on young women's success in STEM<sup>10,20,22</sup> at all ages, especially when interventions subtle gender bias in hiring & promotion, evaluation of are intentionally facilitated<sup>3-5,7</sup> with a structured program Effect of instructor gender on undergraduate calculus students<sup>4</sup> With a woman professor, Before a role model session · All students, regardless of gender, participated more & asked Ask students to reflect13 on their more questions than when taught by a man<sup>4</sup> · Women's association with & liking of math increased similarities to the role model(s)15 (?) '| Reflection can shift students' perceived stereotypes<sup>23,47</sup> Underrepresented students in post-secondary benefit from<sup>19</sup>: E.g., thinking about their: Peer networking Academic Mentorship Peer study & clubs<sup>22</sup> support groups<sup>7,22</sup> "current "best" or events2 programs<sup>2</sup> instead "future self" academic self" of Mentors trained in Participating in cultural responsiveness<sup>21,22</sup> can make a role model's success seem undergraduate research<sup>2</sup> more attainable<sup>5,24,47</sup>

Role models are most effective when students feel connected to them.<sup>48,14</sup> For the greatest effect for all students, combine a variety of interventions<sup>1,23</sup> to improve recruitment & retention of underrepresented groups in STEM.

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## **Role Models in STEM**



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#### **Resources:**

Skype a scientist: skypeascientist.com I am a scientist: iamascientist.info ESS' Designing Gender-Inclusive (STEM) Classrooms: successinstem.ca/resources

About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions to foster positive working environments for people in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down barriers people face on their pathway to success. Canada's Social Sciences and Humanities Research Council reviewed and funded this project

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## Reducing Boys' Gender Bias & — Improving Girls' Anticipated Fit in STEM



How can we encourage girls to consider STEM as viable career paths? We research middle school students.

#### Theories & Data Behind Our Research<sup>1</sup>



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## Reducing Boys' Gender Bias & Improving Girls' Anticipated Fit in STEM



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## About Project PRISM

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## **Reducing Boys' Stereotyping** of Girls' STEM Ability



Our research team designed & tested an **intervention**<sup>1</sup> aimed at **reducing gender stereotyping** in STEM environments<sup>2-4</sup>, **improving the climate** before girls decide whether to take STEM courses in high school<sup>5</sup>



## **Reducing Boys' Stereotyping** of Girls' STEM Ability

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## Intersectionality in STEM

## 

#### Intersectionality<sup>1</sup>

is a **framework** used to analyse how **systems** of power and oppression impact individuals' lived experiences based on their various social group identities.<sup>1,2,3</sup>



## Impact on Workplace Climates

Women of colour face a **"double jeopardy"<sup>4,5,8,9</sup>** Prejudices Stereotypes Harassment Against people of colour They experience prejudice and discrimination both as a woman and as a person of colour.<sup>4,5,6,7</sup>

The impact of "double jeopardy" can multiply when a person holds many marginalized identities (e.g. class, sexuality, having a disability, religious practice, etc).<sup>6</sup>

Women of colour experience **more harassment** than men and White women.<sup>5</sup> Harassment is linked to attrition both in workplaces and academic environments. **For example** it is often cited that women make less money than men. Looking closer, the data tells a more nuanced story: White women earn more than Black men, and Black men earn more than Latinx and Black women.<sup>10</sup>

## Why does this matter?

To foster inclusive work and academic environments, we need to understand how people experience these settings differently, and under what conditions.

An intersectional analysis can highlight areas that need improvement, and offer strategies to foster spaces where all identities can thrive.<sup>11</sup>



The following explores a few areas where this analysis is useful for STEM communities.



Learn more about implicit bias, what you can do to combat it, and our research in our white paper series on our website: http://successinstem.ca/

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## Intersectionality in STEM

## Harmful Stereotypes & Behaviour Patterns

Not fitting the stereotype of a person who works in STE can negatively impact employees. The following are patterns that specifically impact women scientists.

#### Prove-It-Again<sup>12</sup>

To be seen as **equally competent** as co-workers women need to provide **more evidence** of their past work, study, and achievements than men.

Look for the intersectional analysis in these sections



Black women report needing to do this more than other women.<sup>12</sup>

#### Tug of War<sup>12</sup>

Gender bias can increase conflict between women.

This can appear as:

- Lack of support for women employees from women coworkers and administrative staff
- Making assumptions about other women's qualifications/effectiveness
- Rivalry between women.

Latinas are more likely to report challenges in receiving support from administrative staff.<sup>12</sup>

While some may assume personalities are the source of these conflicts, it is often a symptom of gender bias in the workplace.<sup>12</sup>

#### The Maternal Wall<sup>12</sup>

After having a child, women are **assumed** to be **not as competent** or **committed** to their work.



Affects women of all backgrounds.<sup>12</sup>

This can lead to an identity conflict where the person juggles the expectations of both work and family roles.<sup>13</sup>

#### The Tightrope<sup>12</sup>

Women's behaviour is often judged in the workplace. It can be perceived as overly:

feminine	masculine
stereotyped as:	unlikeable
likeable	effective
incompetent	cold

Asian-American women report backlash for more "masculine" behaviours than other women.<sup>12</sup>

Women balance the expectation of acting "feminine" with the stereotype that effective scientists have masculine characteristics.

This can lead to more expectations of women doing more "feminine" work such as administration and mentoring.<sup>12</sup>

## **Barriers to Leadership**

With the impact of "**double jeopardy**" and additional discrimination, women of colour's leadership potential can be **significantly reduced**.<sup>7,20</sup>

Coping mechanisms for discrimination can include **detaching from the stressor**, or **internalizing the blame for the reactions**.<sup>21</sup> Neither of these support pursing leadership opportunities.



Black women are perceived **more negatively** in leadership positions than Black men and White women.<sup>15</sup>



They are also disproportionately penalized for mistakes in their role.<sup>15</sup>


### **Beyond Race & Gender**

**Ageism** is also active in the workplace. It is most common among young and older individuals, and is experienced more by women than men.<sup>16</sup>

For example, women academics are scrutinized and discriminated against based on their appearance - a combination of ageism, and "**lookism**" (stereotypes based on what the person wears and how they appear).<sup>17</sup>

**Class** is also worth consideration;<sup>19</sup> discussions about "culture fit" can be subtly asking for experiences only accessible to those with plenty of disposable income.<sup>19</sup> Race and class also interact and impact workers' experiences of sexism<sup>21</sup> and their overall health.<sup>18</sup>

### **Pathways to Persistence**

With the many barriers facing students of colour in STEM programs, there are ways to support their persistence in the field. Strategies that support women of colour include:<sup>14</sup>



### Impact on Equity Processes

A study of the Equal Employment Opportunity Commission (EEOC) in the USA found that plaintiffs who claim discrimination against more than one aspect of their identity were **half as likely** to succeed in their case,

compared to those who allege discrimination against one group (e.g. gender).<sup>22</sup>



EEOC data reveals that intersecting identities can also place groups at low or high risk for experiencing harassment; for example disability, gender, age, and race.<sup>23</sup>

# Seeking Complexity

Using an intersectional lens is critical to understanding the work needed to create more inclusive and safe workplaces for all people.

While researching and proposing solutions to challenges like unconscious bias and stereotype threat, consider the impact of each policy or action from multiple perspectives - ask (and compensate) people from a variety of groups for their feedback.

Intersectionality is an analytical tool that can help to uncover specific challenges and areas for improvement, revealing opportunities to strengthen our practices and environments.

# Intersectionality in STEM



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### About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions. The shared goal of our research is to foster women's inclusion and success in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down the biases girls and women face on their pathway to success. Funded by the Social Sciences and Humanities Research Council.









# **3** Fostering Inclusive Organizational Cultures

Fostering inclusive organizational cultures is crucial for driving innovation, collaboration, and sustained growth. In 'Behavioural Insights to Cultivate Diversity and Inclusion,' ESS Project SINC summarizes various ways business leaders can leverage behavioural insights to make structural changes that will increase diversity, equity, inclusion, and belonging. This perspective frames diversity as a crucial factor for unlocking the full potential of an organization. A 'Business Case for **Gender Diversity'** gives leaders key data about how increasing gender diversity can yield benefits for talent and innovation as well as for governance and the bottom line. Importantly, promoting gender-inclusive policies and practices is not only good for business, it can also foster a more inclusive workplace culture. In 'Gender Inclusive Policies and Practices in Engineering,' research by ESS Project RISE reveals that women working in organizations with more gender inclusive policies and practices experience a more favourable climate and reduced gender identity threat. Finally, organizations often try to promote gender inclusion through diversity training, but work at the Institute for Gender and the Economy (GATE) asks, 'Does Diversity Training Work?' Although such training can be ineffective, it does not have to be. In 'Anti-Bias Interventions: Why They (Need Not) Fair,' ESS Project RISE research suggests that diversity and inclusion training can be effective if it targets an organization's key problem. Together, these papers create a comprehensive blueprint for organizations aspiring to build and nurture genuinely inclusive cultures.



Managers are facing increased pressure & need to ensure **diversity & inclusion (D&I)** in their companies. Traditional initiatives focus on changing individuals, not systems,<sup>2</sup> & have found limited success<sup>3,4</sup>. Below are some easy-to-implement **behavioral approaches** & structural interventions to improve D&I in an organization.<sup>1,5</sup>



















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### **Related ESS White Papers**

De-biasing Job Advertisements Anti-bias Interventions

How can we educate adults about implicit bias in a way that fosters mutual respect and creates a more inclusive culture in the workplace? Project RISE (Realizing Identity-Safe Environments) will harness our understanding of implicit bias, intergroup contact, & social identity threat to create a more "identity safe" workplace culture. Interventions designed to create identity-safe contexts have been shown to narrow the gender gap in academic performance. Project RISE aims to create positive cultural change for women & men in science and engineering by: (1) educating participants about implicit bias, (2) fostering supportive and respectful interactions between men and women in the organization, and (3) providing them with a clear understanding for how to combat bias. Learn more: successinstem.ca/projects/rise

### About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions to foster positive working environments for people in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down barriers people face on their pathway to success. Canada's Social Sciences and Humanities Research Council reviewed and funded this project.











Chair for Women in Science and Engineering BC and Yukon Region

Westcoast Women in Engineering, Science & Technology

### The Business Case for **Gender Diversity**

Over 20 years of research demonstrates a correlation between organisations with high gender diversity in leadership and several measures of organisational success.

Gender diversity is linked to employee satisfaction,<sup>1</sup> improved governance and innovation. It is also associated with financial benefits, including a positive impact on firm value.<sup>2</sup>

While some boards do currently have female members, discrimination still exists as women are more likely to be board members than chairs.<sup>23</sup>

To benefit from gender diversity, organisations should avoid tokenism and ensure there is a "critical mass" of women represented.<sup>17,21,22</sup> This means having at least 2-3 women, or at least 30% of the board.

While correlation does not indicate causation, there is a clear relationship between an organisation's gender diversity and aspects of their success. Longitudinal studies found a correlation between promoting women to executive positions and high profitability over 20+ years.8

In order for change to occur, a paradigm shift is needed where organisations' leadership values diversity, recognises the challenge of expressing diverse opinions, and aims to support the professional development of all employees.<sup>18</sup>



#### **Improved Governance**

Gender diverse boards are more likely to allocate effort into corporate monitoring, and increase participation in decision-making.<sup>10</sup>

#### Women directors:



on boards<sup>14</sup> & negative corporate social practices<sup>1</sup>



Access to More Talent



2006 Canadian Census<sup>16</sup> 47.4% of workforce **21.9%** of engineering

& science workforce Diverse hiring increases the recruiting

pool<sup>17</sup> and is a more effective use of talent and leadership<sup>18</sup>

### **More Innovation**

If a group includes more women, the collective intelligence rises<sup>19</sup>





Gender diversity has a positive effect on team innovation in radical research<sup>20</sup>

Having a critical mass of 30% or at least 2 or 3 women on a board decreases groupthink<sup>21</sup>

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#### About WWEST

Westcoast Women in Engineering, Science & Technology (WWEST) is the operating name for the NSERC Chair for Women in Science and Engineering (CWSE), BC and Yukon Region. Our mission is to advance engineering and science as welcoming careers that serve our world through holistic understanding and creative, appropriate and sustainable solutions. WWEST works locally and, in conjunction with the other CWSE Chairs, nationally on policy, research, advocacy, facilitation, and pilot programs that support women in science and engineering.

#### About the Chairholder

The Chair is held by Dr. Elizabeth Croft, P.Eng., FEC, FASME. Dr. Croft is the Associate Dean, Education and Professional Development in the Faculty of Applied Science, and a Professor of Mechanical Engineering at the University of British Columbia. She is also the Director of the Collaborative Advanced Robotics and Intelligent Systems (CARIS) Laboratory. Her research investigates how robotic systems can behave, and be perceived to behave, in a safe, predictable, and helpful manner. She is the lead investigator of "Engendering Engineering Success," a 3-year interdisciplinary research project that aims to take an evidence-based approach to increasing the retention of women in engineering by understanding and changing aspects of workplace culture that place women at a disadvantage.

#### Thank you to our sponsors

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# Gender inclusive policies and practices in engineering



### What are the benefits of a gender inclusive workplace culture?

Our research suggests that employees' perceptions of the inclusivity of their workplace can have important implications for their day-to-day experiences on the job.



# Gender inclusive policies and practices in engineering

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THE UNIVERSITY OF BRITISH COLUMBIA







# DOES DIVERSITY TRAINING WORK?

### Forms of diversity training:

Implicit Bias Training Anti-Bias Training Sensitivity Training **Cross-Cultural Training** 



### What do we know about diversity training?



Real outcomes in skills, knowledge and learning. People attending a training program are more likely to increase their knowledge/skills around diversity.

#### Positive effects on behavior.

An individual's attidudes over time can be impacted by changing behaviors and knowledge.

#### Create a culture of change.

Training can help develop a growth mindset regarding the malleability of diversity-related behaviors.

#### Unlock the potential of teams.

Encouraging individuals to take the perspectives of those who are different from them enhances creativity.





Are the results reliable?

Program evaluations (particularly self-assessments) don't often correctly reflect participant's bias/prejudice.

#### Worse behavior.

Diversity training can lead to worse behaviors if participants resent being selected for the training.

Illusion of fairness. The presence of diversity training can make a company feel it doesn't have a problem with bias when it does.

Stereotype rebound. In some cases, participants who are instructed to avoid stereotypes will enact more stereotypical behaviors.



### How to implement diversity training effectively

- Take a behavioral approach.
- Use data and develop impact measurements.
- Host your training in an educational setting.
- Make it voluntary.
- Create new norms and set examples.
- Spread out sessions over several days/weeks.
- Integrate with other policies and programs.

#### Other ways to challenge inequality...

- Review hiring practices.
- Develop skills-based assessments.
- Create mentoring and sponsorship programs.
- Establish diversity committees or task forces.

## Rotman

To learn more visit: www.gendereconomy.org/does-diversity-training-work/ Illustrations designed by Freepik

**Engendering Success in STEM** 

44



**Anti-bias trainings** are a billion dollar industry<sup>2</sup> & a popular response to address systemic bias issues & promote diversity, equity, & inclusion.

They are easier to implement than structural change, but are anti-bias trainings actually effective?













This typology shows how in-the-moment awareness, motivation, & efforts to regulate behaviour shape the translation of individuals' BIASes into behaviour within a given context



For more information visit: successinstem ca









#### **How This Framework Can Inform Trainings & Interventions** It is important to consider systemic biases when conducting anti-bias work instead of focusing on individuals. BIASes & their expressions are all equally harmful, whether implicit or ambiguous.<sup>16</sup> Organizations should start by **identifying** which type of **bias** or **cultural norm** is of concern, & create a plan, keeping the following strategies in mind: What to do when... Bias-relevant event **Research supported strategies** In the moment... Do those involved Remove names/gender indications of applicants while hiring<sup>18,28</sup> hold beliefs or implicit • Expose staff to examples of people who contradict group stereotypes<sup>17</sup> Yes attitudes or stereotypes • A sustained commitment to recruit & retain underrepresented role models about the group? can reduced BIASes<sup>29</sup> Motivation Yes No Is the person motivated to be • Frame hiring/promotion criteria to emphasize • Promote **benefits of diversity**<sup>31,32</sup> & egalitarian? quality of ideas not leadership record<sup>30</sup> value of multiculturalism<sup>33</sup> · Recognize that merit-based practices can still Increase intrinsic motivation by be biased<sup>19</sup> encouraging growth mindsets<sup>34</sup> Awareness Yes No Is the person • Awareness by itself does not change a culture Teach people what bias is & to identify aware of their Teach people to identify when their BIASes bias when it occurs (e.g., through BIAS and the are activated & expressed videos<sup>20</sup> or interactive games<sup>35,36</sup>) harm it can do? Note: people can make biased & discriminatory Communicate & model inclusive decisions even if they are aware their norms in the organization supervisor is prejudiced<sup>26</sup> Regulation **Failed Regulation** No Regulation **Up Regulation** Does the person • Present bias as habit to Reflecting on core Reduce threats that make an effort to regulate their BIAS? **be broken**<sup>21</sup> e.g., replace values can make a trigger negative reactions stereotypic thoughts with motivated BIASes person more open to finding common ground neutral ones Shift organizational norms with others<sup>24,25,27</sup> Skill training & interventions towards inclusivity should be long-term<sup>37</sup> Changing norms can also be done through policies & practices, & does not need buy-in from everyone in an organization.<sup>23</sup> Organizations should track, communicate & assess changes in culture over time.<sup>22</sup>

in an organization.<sup>23</sup> Organizations should track, communicate & assess changes in culture over time.<sup>22</sup> Most effective interventions create partnerships across identity lines, with a critical mass of people in an organization working together toward the shared goal of creating an inclusive culture that fosters well being.









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#### About Project RISE

How can we educate adults about implicit bias in a way that fosters mutual respect and creates a more inclusive culture in the workplace? Project RISE (Realizing Identity-Safe Environments) will harness our understanding of implicit bias, intergroup contact, and social identity threat to create a more "identity safe" workplace culture. Interventions designed to create identity-safe contexts have been shown to narrow the gender gap in academic performance. Project RISE aims to create positive cultural change for women and men in science and engineering by: (1) educating participants about implicit bias, (2) fostering supportive and respectful interactions between men and women in the organization, and (3) providing them with a clear understanding for how to combat bias. Learn more at: successinstem.ca/projects/rise

#### About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions to foster positive working environments for people in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down barriers people face on their pathway to success. Canada's Social Sciences and Humanities Research Council reviewed and funded this project.

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# Best Practices for Organizations

Beyond fostering an inclusive workplace culture, research has also yielded insights into specific best practices that leaders can use to increase attraction and retention of women. First, **'Measuring Representation in Your Organization'** reminds us that you cannot change what you do not measure. As described in **'The Gender Equality Challenge: Would Quotas Help?'**, some governments and organizations could employ quotas to achieve their gender diversity goals. To achieve an organization's targets, **'De-biasing Job Advertisements'** can help to maximize the number of women applying for STEM jobs. Given the new challenges of working remotely, team leaders can also realize the greater innovation that comes from diverse teams by employing strategies detailed in **'Leading Remote Teams with Equity, Diversity, and Inclusion.'** Finally, leaders are reminded that 'Mentoring Works' and are encouraged to set up mentoring programs that create more robust social networks that include women and members of other underrepresented groups. Together, these papers provide STEM organizations with a holistic framework, highlighting practices and strategies that can facilitate the ascension of women in these traditionally male-dominated fields.

# **⊿EES**

# Measuring Representation in Your Organization



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### **©** gender economy THE GENDER EQUALITY CHALLENGE: Would quotas help?



**5% of the 500 CEOs** on the 2016 Fortune 500 list are women, a mere 27 out of 500



In Canada, despite a "comply or explain" disclosure regime, **45% of companies still have no women** on their boards



Men are **two to three times more likely** to hold senior management positions

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In Canada, achieving **30% female** representation on boards of directors would require at least **30 years** 

### SOMETHING MUST CHANGE... Should government or firms impose quotas?



Quotas WON'T work

**Perceived as unjust:** Quotas may be seen as violating justice for individuals, even if the group outcome is improved.

**Potential stigma:** If women are added to boards at token levels, they might be seen as less qualified and will likely be delegitimized.

**Reduced employee engagement:** Perceptions of unfairness can lead employees to disengage.

**Reduced support for diversity:** 

Because quotas are externally imposed, managers may not be motivated to support the goals.

Failure to address underlying discrimination: Quotas per se do not address the underlying bias in society.



#### Quotas WILL work

Fears about quotas are overblown: Countries that don't have quotas fear them, countries that do, appreciate them.

No pipeline problem: Imposing quotas leads boards to search more creatively for new members, increasing candidate pools.

No stigma: Quotas achieve a critical mass of women, thus avoiding tokenism and marginalization.

**Substantial positive effects:** Diversity in leadership makes groups more effective.

A useful shock to the system: Quotas provide a structured framework to overcome biases.

### BUT HOW? Next steps:



If you DON'T use quotas

**Engage** in targeted recruiting to reach out to potential female candidates.

Provide voluntary opportunities for diversity training.

Appoint diversity managers to increase social accountability.

Create corporate diversity task forces.

Hold people accountable through external monitoring.

Set diversity targets as part of compensation and reward systems.



#### If you DO use quotas

**Frame** affirmative action plans as remedying past discrimination in order to reduce opposition.

**Establish** a critical mass (30-40%) so that female members are not tokens.

Expand your search and actively seek qualified women.

Shift your definitions of the ideal candidate.

**Expect** some discomfort. Any organizational change requires a period of transition.

### Rotman

To learn more visit: http://uoft.me/Quotas

# De-biasing Job Advertisements



Language in job advertisements can signal what **kind of applicant** the organization is looking for (traits, behaviors) & affect whether a person thinks they are a **good fit** for the position.<sup>1,13,14</sup>



This is important in Science, Technology, Engineering & Mathematics (STEM) fields where women are **generally underrepresented**,<sup>2</sup> & hold fewer senior leadership positions.<sup>3</sup> Job ads for male-dominated jobs tend to use more **stereotypically masculine language**, which makes women feel that **they don't belong**.<sup>4</sup>

When women apply for these types of jobs, they may attempt to correct for their feeling of lack of fit by **downplaying feminine language** in cover letters, which can make them less likely to get the position.<sup>7</sup> They also may expect the hiring process to be **biased against them**.<sup>56</sup>

Masculine language in job postings can **perpetuate & sustain gender segregation** in jobs, & keep women out of male-dominated fields.



# De-biasing Job Advertisements



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De-bias your job ad with these tools: textio.com gender-decoder.katmatfield.com

### About Project SINC 🥝

How can we ensure that young women have the mentoring support and inclusive networks they need to launch their careers successfully? Project SINC (Shaping Inclusive Network Cultures) aims to increase integration of women in social networks as they transition from university to the workplace. Promotion and retention at work is tied to an employee's integration in social networks and interactions with colleagues, but women in STEM often report subtle signs of exclusion in their interactions with others in male dominated fields. These experiences of exclusion make women especially aware of their gender and contribute to workplace burnout. SINC uses advanced methods to examine daily experiences and test interventions. One intervention is designed to increase belonging and reduce stress among identity-threatened students. A second intervention will use more equitable role assignments to increase positive interactions between men and women in the workplace.

# About Engendering Success in STEM (ESS)

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# **Leading Remote Teams** with Equity, Diversity, & Inclusion

#### Working remotely brings unique challenges and opportunities. For leaders and managers of teams, three areas to consider include:



Teams need leaders to provide hope & compassion in difficult times. Effectively supporting teams collectively & individually will have enduring benefits.

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# **Leading Remote Teams** with Equity, Diversity, & Inclusion

For more details about these practices and tools, read the full article listed below:

### References

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### **About ACEC-BC**

The Association of Consulting Engineering Companies British Columbia (ACEC-BC) has proudly served as the voice of Consulting Engineering companies in BC since 1976.

We collaborate with members and industry stakeholders to advance the business interests of consulting engineering firms in BC, serving the interests of our members through advocacy, creating opportunity for collaboration, and building awareness of the industry's contributions to society and innovative technical expertise. Values unite our members and our governance. Together, we act collaboratively, promote innovative thinking, and invest in our community.

Learn more about ACEC-BC by visiting acec-bc.ca.

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### **Mentoring Works**

### Why Mentoring?

Women who have a mentor can advance more quickly, and to higher levels, than those who are not supported.<sup>3</sup>

Mentoring relationships can be formal or informal, and short or long term.

Formal relationships are often arranged by an organisation or workplace, have pre-articulated expectations, and often include launches, wrap-ups, and socials to normalize expectations. Formal mentorships create an environment where it is easy to get involved, but may cause concerns of time commitment and how "visible" the relationships are.

Informal mentoring is often arranged by individuals, so expectations are not always pre-determined and must be set by the mentor and mentee. They often focus on a specific need. Time commitments are more flexible, and informal mentorship is less "visible." Difficulty establishing connections can make it challenging to become involved.

Short term mentoring formats include speed mentoring, project-specific mentors, shadowing, or transition mentors.

Long term mentoring may include regular or ad-hoc meetings, peer mentors, and most mentoring programs.

Online mentoring may use either format.





a place of mind

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**NSERC** Chair for Women in Science and Engineering **BC** and Yukon Region

Westcoast Women in Engineering, Science & Technology

# Ranked Facilitative Responses<sup>2</sup>

# Facilitative Conditions<sup>1</sup>

Reflecting &	Conveys you have heard and	Friendliness	Sharing mutual interests	Genuine warmth	Genuine sense of comfort and support	
Understanding Feelings	understood their emotional experience	Understanding	l Empathy ack		Perceive and nowledge their experiences	
Clarifying & Summarizing	Focuses the discussion; indicates accurate hearing & understanding Indicates a desire to be accurate in communication	Caring	Value them as a person co	Personal mmitment to the process	Personally care about their well-being	
Questioning	Seeks information & furthers discussion	Respect	Right to express their own deas and feelings their ow		Right to shape their own lives	
Reassuring & Supporting	May dismiss the person's feelings (negative) Indicates a belief in their	Trustworthiness	Confidentiality and security in relationship Honesty			
Analyzing &	ability to solve the problem Trying to explain behaviours or feelings	Acceptance	Accept who they are	Respect the and dignit	personal worth y of a person	
Advising	Responses may imply what they should think or do What you should do or feel	6 conditions must be met to create a relationship in which a person feels <b>comfortable to self-disclose</b> . <sup>1</sup> In a mentorship, this relationship is <b>reciprocal</b> .				
Evaluating	Judges what you do or feel	Types of Questions         Effective:       Ineffective:         • Are person-centred       • Completely change the focus				
In a mentoring relationship, <b>how you respond</b> affects how the other person responds. Choosing a		Are <b>open</b> Are binding     Ask " <b>why</b> " (without being     intimidating)     Are binding     Solicit agreement     Force choices				

response is context and relationship dependent.

- Force choices
- Have "no good answer"
- Are yes/no

### **Mentoring Works**



### **Mentoring at Work**

Increasing workplace diversity, especially at the mid- and upper levels, can be supported through diversity mentoring programs.<sup>8</sup>Organisations should also consider how to promote and support a variety of forms of mentoring, and reduce barriers to employees' participation.

Often, individuals who need mentoring the most are unable to find mentors because they are afraid to ask, or are searching for the "perfect fit" mentor.<sup>7</sup> Informal mentoring can help resolve this. Peer mentoring is also beneficial; individuals with similar levels of experience act as both mentees and mentors to each other,<sup>7</sup> offering advice and support in navigating the workplace and decision-making.<sup>6</sup> There is value for employees at all levels, including executives.<sup>5</sup>

Finding mentors outside of the workplace can address individuals' life satisfaction levels, and provide outsider perspectives on work-related issues.<sup>5</sup> Participating in multiple types of mentorship (peer, senioritybased, non-work, etc.) provides more opportunities for an individual's holistic personal development.<sup>5</sup>

Facilitative responses should be used as tools for strengthening relationships, and ensuring individuals feel comfortable self-disclosing. Setting expectations is key in ensuring a successful mentoring relationship.



# Allyship and Anti-Bias Behaviours

Finally, creating more diverse, equitable, and inclusive educational and organizational STEM environments is something we can all work toward together. In *'What is Allyship?'*, ESS Project RISE describes a typology of actions that individuals can use to either react to bias or to proactively foster greater inclusion. Then, a trio of white papers provide a series of bias-busting strategies. *'Bias Busting Strategies for Individuals'* deals with the subtle biases that often permeate individual judgments and interactions and offers strategies to counteract and challenge them at a personal level. *'Bias Busting Strategies for Interpersonal Interactions'* sheds light on how biases can inadvertently influence our interactions with others and provides tools and techniques to foster genuine, inclusive social connections. Finally, *'Bias Busting Strategies for Institutions'* zooms out to examine systemic biases embedded within institutions. Recognizing that individual and interpersonal efforts need to be mirrored at the institutional level, this paper outlines frameworks and policies that can actively dismantle ingrained biases and create an environment where allyship is not just encouraged but integral. Collectively, these papers paint a comprehensive picture of the journey from self-awareness to systemic change, urging readers to be active allies, challenge biases, and advocate for equity and inclusivity at every level.

# What is Allyship? A Typology of Allyship Action



The meaning of **allyship**<sup>1</sup> is not always clear; research definitions vary & often focus on single actions (with a few exceptions<sup>2-5</sup>).

To explore this further, we developed a **typology** of **allyship actions**.

**Allyship actions** are **singular actions** that people take to support disadvantaged groups.<sup>1</sup> They vary in scope & scale, & can be effective in curbing prejudice (e.g., confrontation<sup>10-12</sup> or supporting social change initiatives<sup>13</sup>).

#### We define allyship<sup>1</sup>as:

Comprised of several actions (not just one) that are:

Motivated by goals to support groups that are disadvantaged <sup>6</sup>	A r b

Are or would be recognized as supportive by these groups<sup>7</sup>

People are not allies; people do allyship.1

### Typology of Allyship Action

In our typology, allyship actions can be either **reactive** or **proactive** behaviors, determined by three features: **timing, aim**, & **focus**.

#### Features of allyship actions



# What is Allyship? A Typology of Allyship Action

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adults about implicit bias in a way that fosters mutual respect and creates a more inclusive culture in the workplace? Project RISE (Realizing Identity-Safe Environments) will harness our understanding of implicit bias, intergroup contact, and social identity threat to create a more "identity safe" workplace culture. Interventions designed to create identity-safe contexts have been shown to narrow the gender gap in academic performance. Project RISE aims to create positive cultural change for women and men in science and engineering by: (1) educating participants about implicit bias, (2) fostering supportive and respectful interactions between men and women in the organization, and (3) providing them with a clear understanding for how to combat bias. Learn more at: successinstem.ca/projects/rise

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# **Bias Busting Strategies** *for Individuals*



Find out what strategies () and actions () you can take to counteract implicit bias<sup>5</sup>.



Implicit bias is the unconscious, automatic tendency to associate certain roles or traits with one social group more than another.<sup>6</sup>

# What Can We Do as Individuals?













# **Findings & References**

1. Regulating your own biased responses can facilitate the reduction of bias.

Devine, P. G., Forscher, P. S., Austin, A. J., & Cox, W. T. (2012). Long-term reduction in implicit race bias: A prejudice habitbreaking intervention. *Journal of Experimental Social Psychology*, 48(6), 1267-1278.

2. Exposure to counterstereotypic examples effectively weakens stereotypes held about a given group.

Dasgupta, N., & Asgari, S. (2004). Seeing is believing: Exposure to counterstereotypic women leaders and its effect on the malleability of automatic gender stereotyping. *Journal of Experimental Social Psychology*, 40(5), 642-658

3. Getting to know more about people as individuals helps us evaluate members of different social groups based on personal, rather than group-based, attributes.

Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta analytic tests of three mediators. *European Journal of Social Psychology*, 38(6), 922-934.

- 4. Being motivated to set biases aside predicts more equitable decisions and outcome for groups who would otherwise be disadvantaged by implicit bias.
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With funding from the Social Sciences and Humanities Research Council.









# **Bias Busting Strategies** for Interpersonal Interactions



# What Can We Do in Our Social Interactions?



The actions suggested here are just a few examples of steps you can take. Learn more about implicit bias, what you can do to combat it, and our research in our white paper series and on our website: http://successinstem.ca/











# **Findings & References:**

- Perspective taking increasing psychological closeness, which decreases bias. Galinsky, A. D., & Moskowitz, G. B. (2000). Perspective-taking: decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of Personality and Social Psychology*, 78(4), 708.
- 2. Increased contact can reduce implicit bias by changing our cognitive representations (how we imagine a group of people) of social groups, directly improving evaluations of the group, and fostering mutual respect between conversational partners.

Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta analytic tests of three mediators. *European Journal of Social Psychology*, 38(6), 922-934.

3. Both men and women can advocate on behalf of underrepresented groups to facilitate change and break discriminatory norms.

Paluck, E. L., & Shepherd, H. (2012). The salience of social referents: A field experiment on collective norms and harassment behavior in a school social network. *Journal of Personality and Social Psychology*, 103(6), 899.

4. Because men and women can be interested in different social activities, women are often excluded from opportunities that arise from informal networking.

De Welde, K., & Laursen, S. (2011). The glass obstacle course: Informal and formal barriers for women Ph. D. students in STEM fields. *International Journal of Gender, Science and Technology, 3*(3), 571-595.

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# **Bias Busting Strategies** for Institutions



Find out what strategies (🗭) and actions (🔊) you can take to counteract implicit bias<sup>7</sup>.



**Implicit bias** is the **unconscious**, automatic tendency to associate certain roles or traits with one social group more than another.<sup>8</sup>

# What Can Institutions Do?

### **Perform a policy** "safety check"<sup>1</sup> @

Ensure that your institution has gender inclusive<sup>2</sup> policies.



### Use gender inclusive imagery<sup>2</sup> @

Use gender inclusive photos and pronouns on promotional materials. @



### **Increase the** representation of women in top positions<sup>3</sup> @ @

Seek out and hire women. Establish a goal for women across your institution.



### Promote diversity @ training efforts & accountability<sup>4</sup>

Implement diversity trainings and assess their effectiveness. @

### Adopt anonymous @ evaluation practices<sup>5</sup>

Redact applicants' names from application materials. 👁





### Support outreach activities<sup>6</sup> Ø

Speak at an event that inspires young girls to consider your STEM field as a career path.€

The actions suggested here are just a few examples of steps you can take. Learn more about implicit bias, what you can do to combat it, and our research in our white paper series and on our website: http://successinstem.ca/










## **Bias Busting Strategies** *for Institutions*



## **Findings & References:**

 Women who work at companies with gender inclusive policies are less worried about experiencing workplace sexism. These policies create a positive social climate between men and women by helping to improve interaction guality.

Hall, W. M. (2016). Interpersonal triggers and cultural moderators of social identity threat (Doctoral dissertation). University of British Columbia. Retrieved from https://open.library.ubc.ca/cIRcle/collections/24/items/1.0307372

2. Women are more attracted to companies that use gender inclusive photos and pronouns in their promotional materials.

Murphy M. C., Steele C. M. and Gross J. J. (2007) Signaling threat: How situational cues affect women in math, science, and engineering settings. *Psychological Science*, *18*(10), 879–885.

- 3. Having female role models in leadership positions can reduce automatic gender stereotypic beliefs. The more frequent the exposure to these successful women, the stronger this effect becomes. Dasgupta, N., & Asgari, S. (2004). Seeing is believing: Exposure to counterstereotypic women leaders and its effect on the malleability of automatic gender stereotyping. *Journal of Experimental Social Psychology*, 40(5), 642-658.
- 4. The percentage of women selected for positions dramatically increases when judges are unaware of the candidate's gender. Gender biases favoring men are likely to occur when judges are aware of the candidate's gender.

Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, *109*(41), 16474-16479. Rouse, C. (2000) Orchestrating impartiality. The impact of 'blind' auditions on female musicians. *American Economic Review*, *90*, 715-741.

5. When done well, knowledge about the importance of diversity and inclusion is powerful, especially when it is paired with organizational structures designed to hold those in top-level positions (e.g., managers) accountable.

Kalev, A., Dobbin, F., & Kelly, E. (2006). Best practices or best guesses? Assessing the efficacy of corporate affirmative action and diversity policies. *American Sociological Review*, 71(4), 589-617.

6. Motivating women and girls to pursue careers in fields where they are highly underrepresented (e.g., science, technology, engineering, and math) can increase the gender diversity of the field.

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## About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions. The shared goal of our research is to foster women's inclusion and success in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down the biases girls and women face on their pathway to success. With funding from the Social Sciences and Humanities Research Council.

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