

# Enacting workplace culture change for excellence in research: a gender lens

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## Abstract

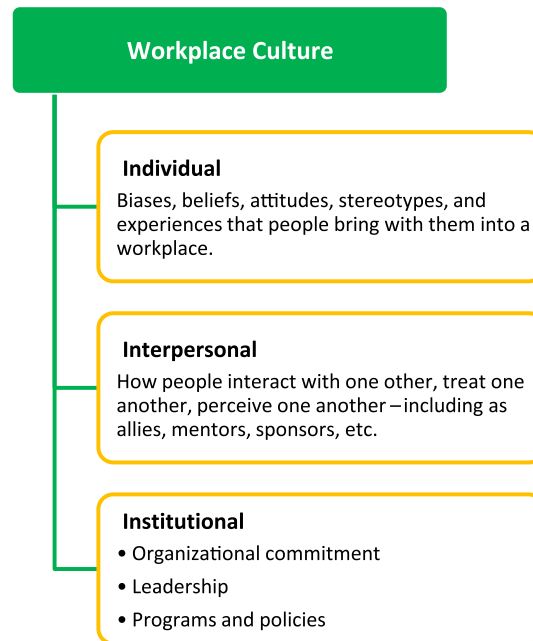
Science and engineering research excellence can be maximized if the selection of researchers is made from 100% of the pool of human talent. This requires policies and approaches that encourage broad sections of society, including women and other underrepresented groups, to participate in research. Institutional policies, interpersonal interactions, and individuals' attitudes are drivers of workplace culture. Here, some new evidence-based and systematic approaches with a focus on culture are proposed to foster women's inclusion and success in science and engineering.

**Key words:** culture, science, engineering, inclusion, women, systematic

## Introduction

Defining and measuring research excellence is complex and problematic (Moore et al. 2017); however, there is evidence to support the assertion that equity, diversity, and inclusion in science yields a more comprehensive knowledge base (Fehr 2011) and a competitive edge (Powell 2018). Diverse teams can be more creative and cognitively flexible (Page 2007) and have a lower risk of social-psychological phenomenon of “group think”, thereby enriching the pool of contributions (Graydon 2015).

In addition, diversifying the labor pool addresses science, technology, engineering and mathematics (STEM) skills shortages by mobilizing talent that is otherwise being overlooked or underutilized. A recent study undertaken by the Council of Canadian Academies (CCA 2018) highlighted that support for under-represented populations in STEM, including women, is important for broadening and increasing Canada's STEM skill supply.



**Fig. 1.** Parameters influencing culture and sense of inclusion for women.

Globally, female participation in science education and employment is low, and the attrition rate is high; the gender gap widens significantly in the transition from Bachelor's to postgraduate and to research careers (GWK 2018; Huyer 2015). Efforts to increase the representation of women in science-focused degree programs and careers involve multiple strategies at many levels, including training, mentoring, and anonymous review mechanisms. Policies are important but are not necessarily the drivers of the ways in which people interact. In contrast to a simplistic focus on reducing individual bias, organizations might have more success in changing workplace culture (Schmader et al. in press) to foster inclusion that can attract a more diverse workforce and maximize their performance and engagement. Overall, the drivers of attrition of female participation in science and engineering relate to the inclusivity, or lack thereof, of workplace culture: the impacts of institutional policies and practices, interpersonal interactions, and peoples' own individual attitudes, beliefs, and biases (Coe et al. 2019; Witteman et al. 2019). Efforts to change a culture require attention to all three (Kang and Kaplan 2019), as illustrated in Fig. 1.

## Enacting workplace culture change: individual

Strategies to attract diversity to the workforce include intervention programs in childhood for both boys and girls, programs to recruit women back into the science research workforce, and programs that address the intersection of equity, diversity, and inclusion. A study on the effect of the presence of women on the corporate boards of 317 Norwegian companies found that on typical boards consisting of 6–12 members, three women constituted critical mass for them to be integrated into the group thereby influencing the style of work, processes, tasks, and organizational innovation. This number facilitated interaction between majority and minority groups, resulting in better decisions (Torchia et al. 2011).

Distinct from making changes at the organizational level, exposing individuals to new information and perspectives is often assumed to be an effective means to reduce or circumvent people's

implicit biases. However, diversity training often shows limited results in organizational research (Dobbin and Kalev 2018). One reason for the ineffectiveness of these programs is that actually reducing the implicit associations that adults have learned over a lifetime is difficult and unfeasible. Notwithstanding, there is promise in newer interventions more deeply grounded in a basic understanding of the cognitive science that underlies biased thoughts and behaviours. For example, people can develop strategies for counteracting effects that implicit associations might have on their behaviour and decision-making (Devine et al. 2017; Régner et al. 2019).

## Enacting workplace culture change: interpersonal

Scientific research organizations may influence culture by implementing policies and strategies that directly foster or improve respectful interactions between men and women as equal collaborators in scientific endeavors. Allyship is a way to influence culture in the workplace and consists of building relationships based on trust, consistency, and accountability with marginalized individuals and (or) groups.

A newly formed Canadian consortium of researchers in social sciences and applied sciences, Engendering Success in STEM (ESS) ([successinstem.ca](http://successinstem.ca)), is combining expertise in developmental, organizational, and social science, with academics and outreach experts in basic and applied sciences working together to identify evidence-based strategies for creating inclusive workplace cultures. Within this consortium, Project RISE (Realizing Identity Safe Environments) is testing interventions that motivate scientists towards allyship with women and other potentially marginalized team members. Other related projects address the various stages of development, training, and career transitions. A unique aspect of all of these projects is the focus not only on interventions to improve girls' and women's science engagement but also intervening and instilling respect in both genders for the talents and abilities that women bring to science.

Developing positive and respectful relationships between people is one of the most effective ways to break down prejudicial biases. Reactive practices, for example when others challenge inappropriate behaviours, can also reassure women that perceived risks of confrontation need not fall on them alone, or they could be fielded by allies.

## Enacting workplace culture change: institutions

On an institutional level, proactive policies in support of allyship involve elements of informational support, training, advice-giving, and enabling networking and opportunities for mentorship.

The policies and practices that employees perceive to be in place (Hall et al. 2018a) predict the degree to which women report feeling accepted and respected by their male colleagues during daily workplace interactions. These feelings of acceptance and respect then reduce women's concerns that they are judged on the basis of their gender (i.e., lowering social identity threat), diminish their feelings of workplace burnout (Hall et al. 2018b), and empower them to confront sexism. This framework can provide a roadmap for cultural change. Strategies and programs to implement systemic institutional culture change include the Athena Scientific Women's Academic Network (Athena SWAN) ([ecu.ac.uk/equality-charters](http://ecu.ac.uk/equality-charters)), the UNESCO STEM and Gender Advancement project (SAGA) ([en.unesco.org/saga](http://en.unesco.org/saga)), the Programme for Women Professors of the federal government and the states in Germany ([bmbf.de/upload\\_filestore/pub/Strategy\\_of\\_the\\_Federal\\_Government\\_on\\_the\\_European\\_Research\\_Area.pdf](http://bmbf.de/upload_filestore/pub/Strategy_of_the_Federal_Government_on_the_European_Research_Area.pdf)), and STEM Equity Achievement Change (SEA Change) ([seachange.aas.org](http://seachange.aas.org)). Achieving the full impact of these institutional changes entails ensuring that employees are aware of these inclusive policies and believe that others regard them positively.

Strong leadership distributed through all levels, executive champions (e.g., Male Champions for Women in Science: [fondationloreal.com/categories/for-women-in-science/lang/en#male-champions-for-women-in-science-4833](https://fondationloreal.com/categories/for-women-in-science/lang/en#male-champions-for-women-in-science-4833); Catalyst programs CEO Champions for Change and MARC Leaders: [catalyst.org/](https://catalyst.org/)), and local team leadership are crucial for implementing significant workplace cultural change. Setting targets, monitoring the efficacy of policies to effect change, and adjusting at regular intervals is a key to achieve results, e.g., implementing Gender-based Analysis Plus ([cfc-swc.gc.ca/gba-ac/index-en.html](https://cfc-swc.gc.ca/gba-ac/index-en.html) and [gender-summit.com/portia\\_web/assets/GS11NA\\_REPORT\\_EN.pdf](https://gender-summit.com/portia_web/assets/GS11NA_REPORT_EN.pdf)) or monitoring target quotas for the recruitment of young female researchers and executive personnel following the cascade model ([bmbf.de/upload\\_filestore/pub/Strategy\\_of\\_the\\_Federal\\_Government\\_on\\_the\\_European\\_Research\\_Area.pdf](https://bmbf.de/upload_filestore/pub/Strategy_of_the_Federal_Government_on_the_European_Research_Area.pdf)). In multi-level organizations, it is furthermore crucial to ensure that any actions, measures, and policies are disseminated and implemented across all levels of the hierarchy homogeneously to achieve greater efficacy, continuity, and the longevity of the cultural change. With respect to culture, strong leadership sets the tone especially when it comes to being willing to enter into uncomfortable conversations that challenge implicitly biased viewpoints and behaviours.

## Conclusion

Considerations of approach and design are important to achieving success in gender and diversity targets, such as early-stage influences that impact culture and perception in younger cohorts, practices for recruitment in technical careers, and leadership programs in the workplace. Moreover, challenges for women of colour, Indigenous women, women with disabilities, and women from the LGBTQ2S+ community can be distinct and require their own interventions in addition to those strategies presented here. Social science research focusing on researchers in the natural sciences and engineering is poised to make significant contributions to effective best practices and actions, and a consortium approach offers the opportunity to complement the research with real-world experience. Recent studies aim to reveal additional measures and methods designed to complement and amplify the effects of institutional changes. Maintaining dialogue and sharing best practices among policy-makers, experts, and stakeholders will accelerate concept to reality and practical implementation and may lead to more inclusive definitions and measures of research excellence.

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## Author contributions

EH-B, HBB, SM, TS, and JED conceived and designed the study. EH-B, HBB, IRC, AK-K, EL, SM, KN, TS, OT, ST, and JED performed the experiments/collected the data. EH-B, HBB, IRC, AK-K, EL, SM, KN, TS, OT, ST, and JED analyzed and interpreted the data. EH-B, HBB, IRC, AK-K, EL, SM, KN, TS, OT, ST, and JED contributed resources. EH-B, HBB, IRC, AK-K, EL, SM, KN, TS, OT, ST, and JED drafted or revised the manuscript.

## Competing interests

The authors have declared that no competing interests exist.

## Data availability statement

All relevant data are within the paper.

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