Promoting Equity, Diversity, and Inclusion in Engineering
A Holistic Perspective

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UNIVERSITY OF ALBERTA

Land acknowledgement

"The University of Alberta acknowledges that we are located on Treaty 6 territory, and respects the histories, languages, and cultures of First Nations, Métis, Inuit, and all First Peoples of Canada, whose presence continues to enrich our vibrant community."

https://www.ualberta.ca/centre-for-teaching-and-learning/teaching-support/indigenization/land-acknowledgements.html

"The Sweetgrass Bear, by Stewart Steinhauer, is part of the university's efforts to work toward respectful, meaningful reconciliation with Indigenous peoples." https://www.ualberta.ca/the-quad/2016/08/the-sweetgrass-bear.html

My background

- PhD and postdoctoral work in UofA Chemistry
  - Glycobiology: sugar–protein interactions on cell surfaces using computational chemistry and spectroscopy

- Started in the Department October 2018 as a technical writer

- Review grant proposals

- Prepare award nominations

- Draft correspondence for the Department Chair and committee chairs

But I am not an expert on EDI…

Shaping a more equitable and accessible university

The U of A is committed to cultivating an institutional culture that values, supports, and promotes equity, human rights, respect and accountability among all members of our university communities. As part of this, we are planning how to make equity integral to our working and learning culture by shifting from **EDI as 'in addition to,' to EDI as 'what we do.'**

Equality vs. Equity vs. Inclusion

It is assumed that everyone benefits from the same support. They are being treated **equally.**

Individuals are given different support to make it possible for them to have equal access to the view. They are being treated **equitably.**

All 3 can see the view without any support because the cause of inequality was addressed. The systemic barrier has been **removed.**

Some other definitions

- **EDI** = **E**quity, **D**iversity, and **I**nclusion
  - Sometimes   **EDID** = **E**quity, **D**iversity, **I**nclusion, and **D**ecolonization *or*
    JEDI = **J**ustice, **E**quity, **D**iversity, and **I**nclusion

- **Diversity =** Term used to describe the presence of a wide range of human qualities and attributes within a group, organization or society.
  - Includes, but not limited to, race, language, ethnicity, gender identity and expression, sex, sexual orientation, socio-economic status, age, disability, neurodivergence, physical appearance, religious beliefs, political beliefs or other ideologies, ancestry, culture, geographic background

- **STEM** = **S**cience, **T**echnology, **E**ngineering, and **M**athematics

https://www.nserc-crsng.gc.ca/NSERC-CRSNG/Policies-Politiques/EDI_guidance-Conseils_EDI_eng.asp

Equity, diversity, and inclusion (EDI) is a term used to describe policies and practices intended to promote the equitable and meaningful participation of belonging of equity-denied groups…

The three concepts of EDI are separate, yet interrelated. When used together in continuous and coordinated way, they have the potential to create environments that not only respect human dignity but also account for and remove the structural barriers that continue to limit the full participation of equity-denied groups.

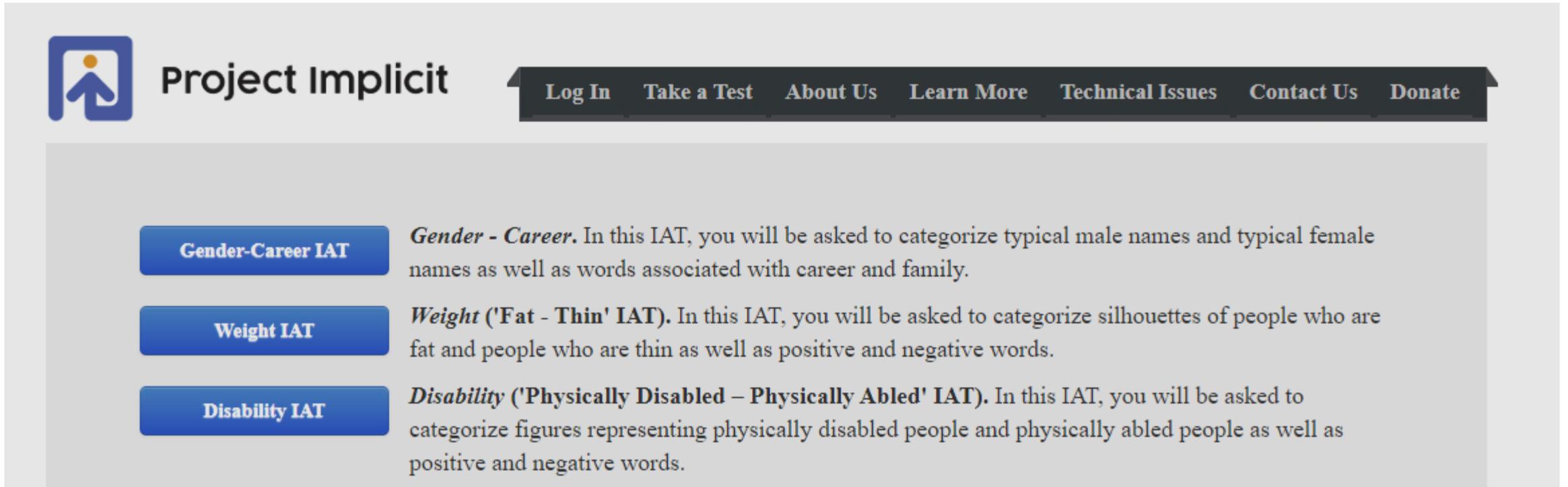# Principles to reduce bias in STEM

1. Learn the basics
   - Diverse teams are more creative and more productive
   - *But* women, racialized and Indigenous peoples, people with disabilities, immigrants, and LGBTQ+ individuals, continue to face substantial discrimination in STEM

2. Acknowledge your biases and privilege
   - Both *conscious bias* (consciously held beliefs about people) and *implicit bias* (attitudes people have but are unaware of) contribute to actions which result in discrimination against people from marginalized groups.
   - Belonging to a particular marginalized group does not automatically make you less biased, even toward those from the same marginalized group

Implicit bias test

Examples

Tests on gender, race, age, sexuality, and others.

Principles to reduce bias in STEM

3. Do your research, listen, and speak up

    - Throughout this presentation are resources to understand EDI- and bias-related concepts and terminology

    - Amplify voices of people from under-represented, participate in conversations about bias and discrimination, and support EDI initiatives in your organization

4. Be inclusive

    - Social activities

    - Group projects/collaborations

Inclusive language

*Inclusive language, also referred to as conscious, equity, or bias-free language, is language that **avoids excluding or alienating people** because of race, gender identity, disability, education level, socioeconomic status, or any other factor.*

The [Linguistic Society of America says](#), "Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities."

ACS Inclusivity Style Guide

- Topics include
  - Age
  - Body size
  - Disabilities, disorders, and other health conditions
  - Etc.

- As well as
  - Forms
  - Data visualization
  - Accessibility

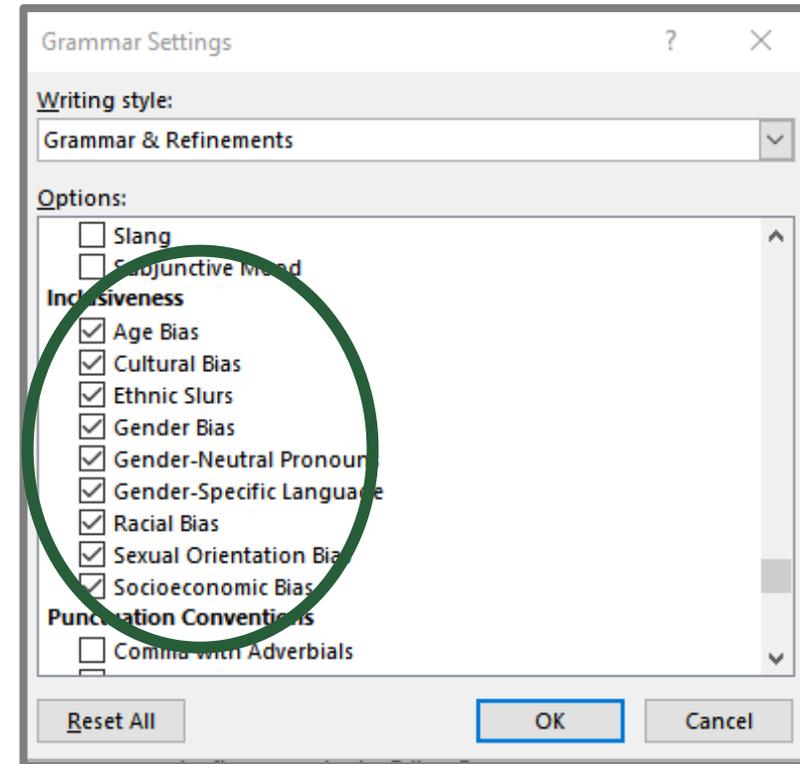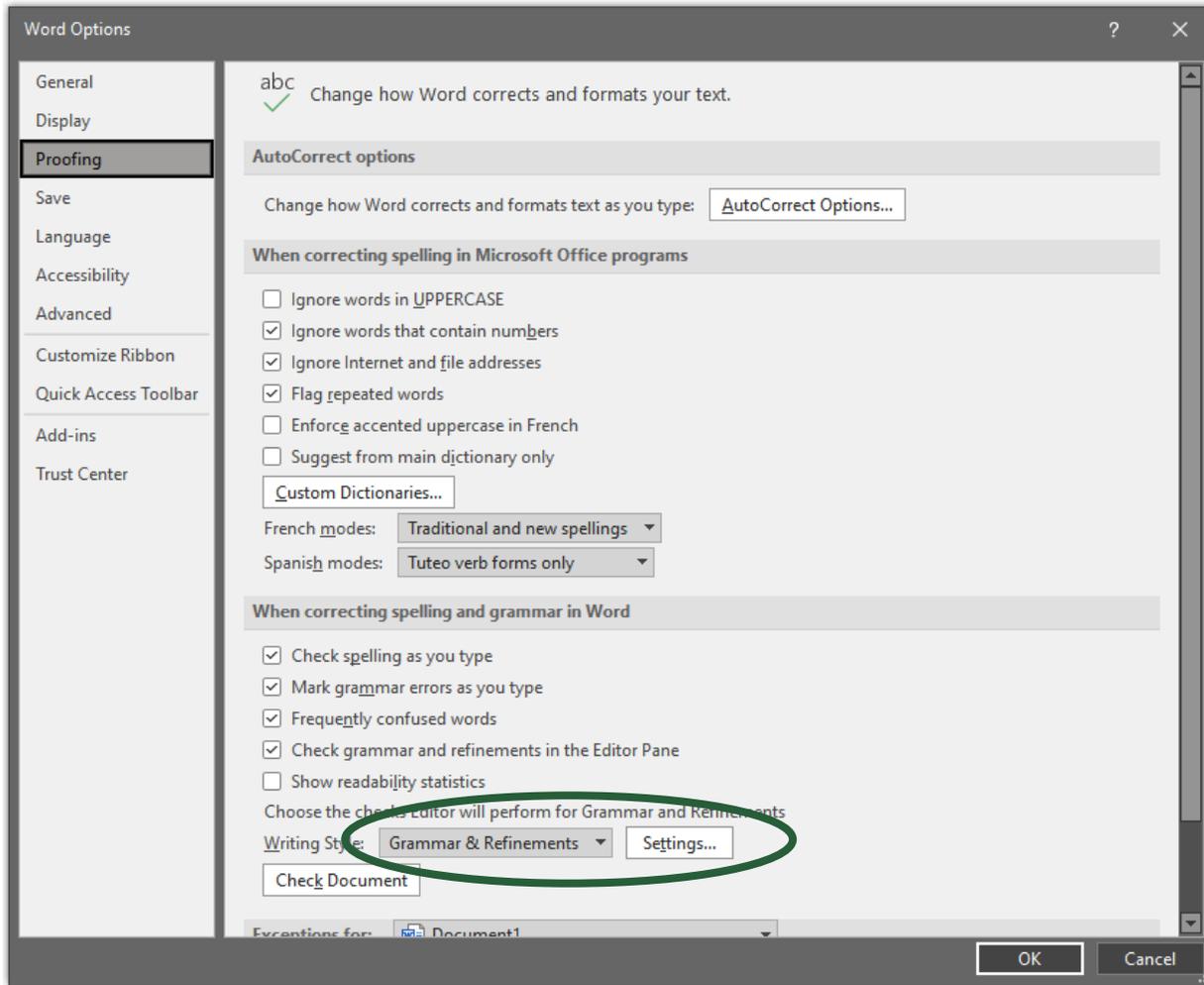# Examples of inclusive alternatives

Not inclusive language

→ Man-made

→ Manned

→ Unmanned

→ Man-hours

Instead use

→ Manufactured

→ Crewed

→ Automated

→ Work-hours/staff-hours

Inclusiveness settings in Microsoft Word

File > Options > Proofing > Grammar and Refinements Settings button

Accessibility and alt text

Alt text is what screen readers read, so it is essential for helping people with low or no vision understand any nontext element, including photos, tables, graphs, and graphics. Alt text also appears when an image doesn't load. The alt text should describe what the image shows without repeating the caption, as a screen reader will also read that.

Eau de toilet: Liquid Assets' smelly spray has more refined uses than you may think.
Manny Morone/C&EN

Alt text: A glass toilet with an atomizer attached to the top, making it look like a sprayable perfume bottle.

Accessibility and colour blindness
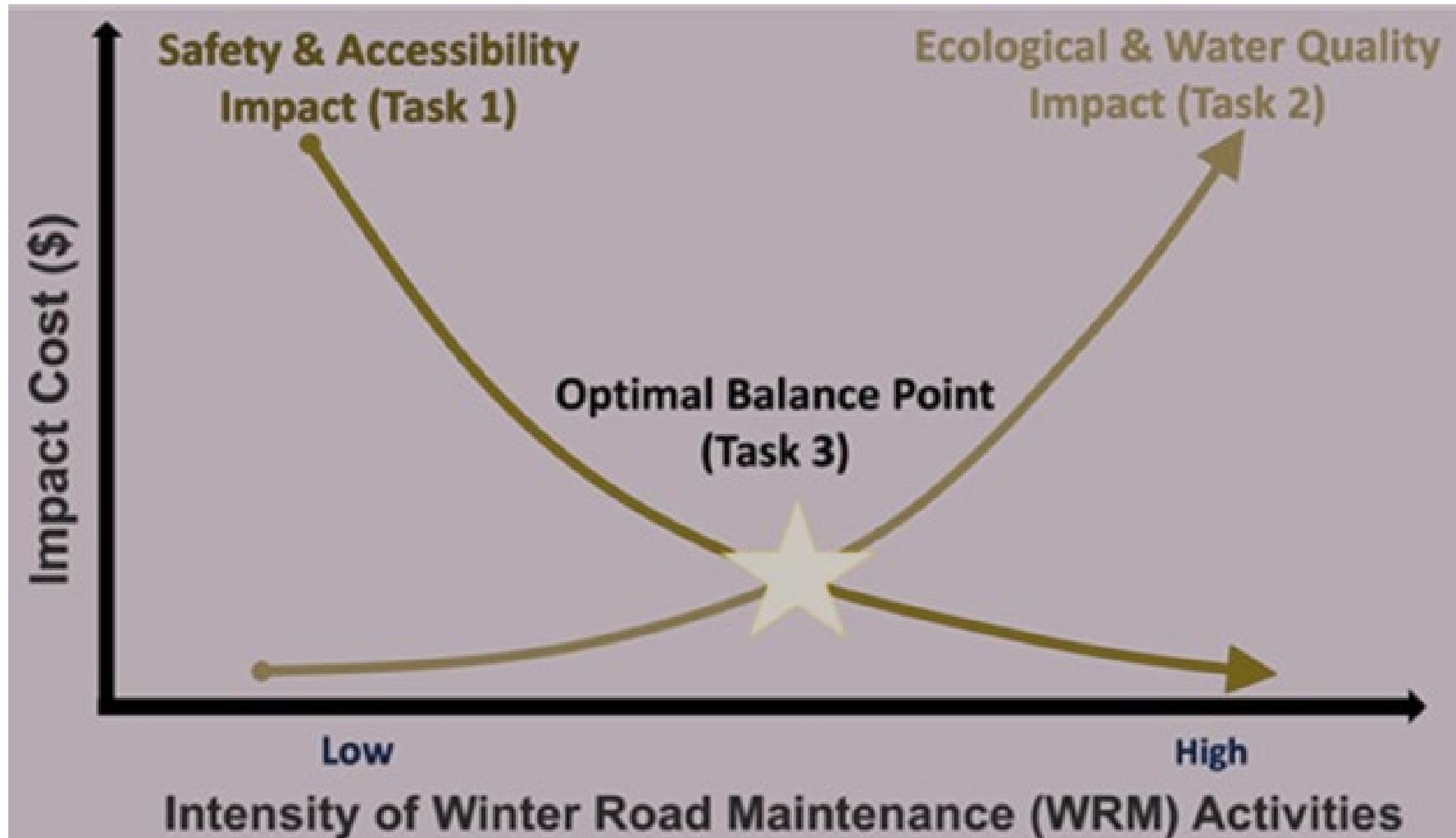
Tri-Agency statement on EDI

The Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, and the Social Sciences and Humanities Research Council of Canada are committed to excellence in research and research training. Achieving a more equitable, diverse and inclusive Canadian research enterprise is essential to creating the excellent, innovative and impactful research necessary to advance knowledge and understanding, and to respond to local, national and global challenges.

With these goals in mind, the agencies are committed to:

- Supporting equitable access to funding opportunities for all members of the research community
- ***Promoting the integration of EDI-related considerations in research design and practices***
- ***Increasing equitable and inclusive participation in the research system, including on research teams***
- Collecting the data and conducting the analyses needed to include equity, diversity and inclusion considerations in decision-making

Through these means the agencies will work with those involved in the research system to develop the inclusive culture needed for research excellence and to achieve outcomes that are rigorous, relevant and accessible to diverse populations.

Discovery grants – Challenges related to EDI

"Challenges related to equity, diversity and inclusion specific to the institution **and** field of research are **clearly described**."

Department numbers:

- Undergraduate students (2022–23, all programs): 940 (*27% female*)
- MSc students (2022–23, all programs): 154 (*45% female*)
- PhD students (2022–23, all programs): 263 (*27% female*)

- Undergraduate students (2021–22, all programs): 980 (*26% female*)
- MSc students (2021–22, all programs): 161 (*41% female*)
- PhD students (2021–22, all programs): 264 (*28% female*)

- Undergraduate students (2020–21, all programs): 974 (*25% female*)
- MSc students (2020–21, all programs): 164 (*37% female*)
- PhD students (2020–21, all programs): 260 (*27% female*)

In our Department, <1% of graduate students are Indigenous

Discovery grants − Challenges related to EDI

"Challenges related to equity, diversity and inclusion specific to the institution **and** field of research are **clearly described**."

University overall

- 55% of undergraduate students are female
- 54% of graduate students are female

- 4% of undergraduate students are Indigenous
- 3% of graduate students are Indigenous
  - Within the Indigenous cohort, ~2/3 are Métis and ~1/3 are First Nations

Data on other aspects of diversity (LGBTQ2SI+, visible minorities, persons with disabilities/ accessibility needs, etc.) are not being tracked consistently.

Demographics of the UAlberta
2020 Annual survey report
2020−21 Enrolment data from FGSR

Aspects of diversity

Wheel of Power/Privilege: The closer to the centre in each category, the more privilege
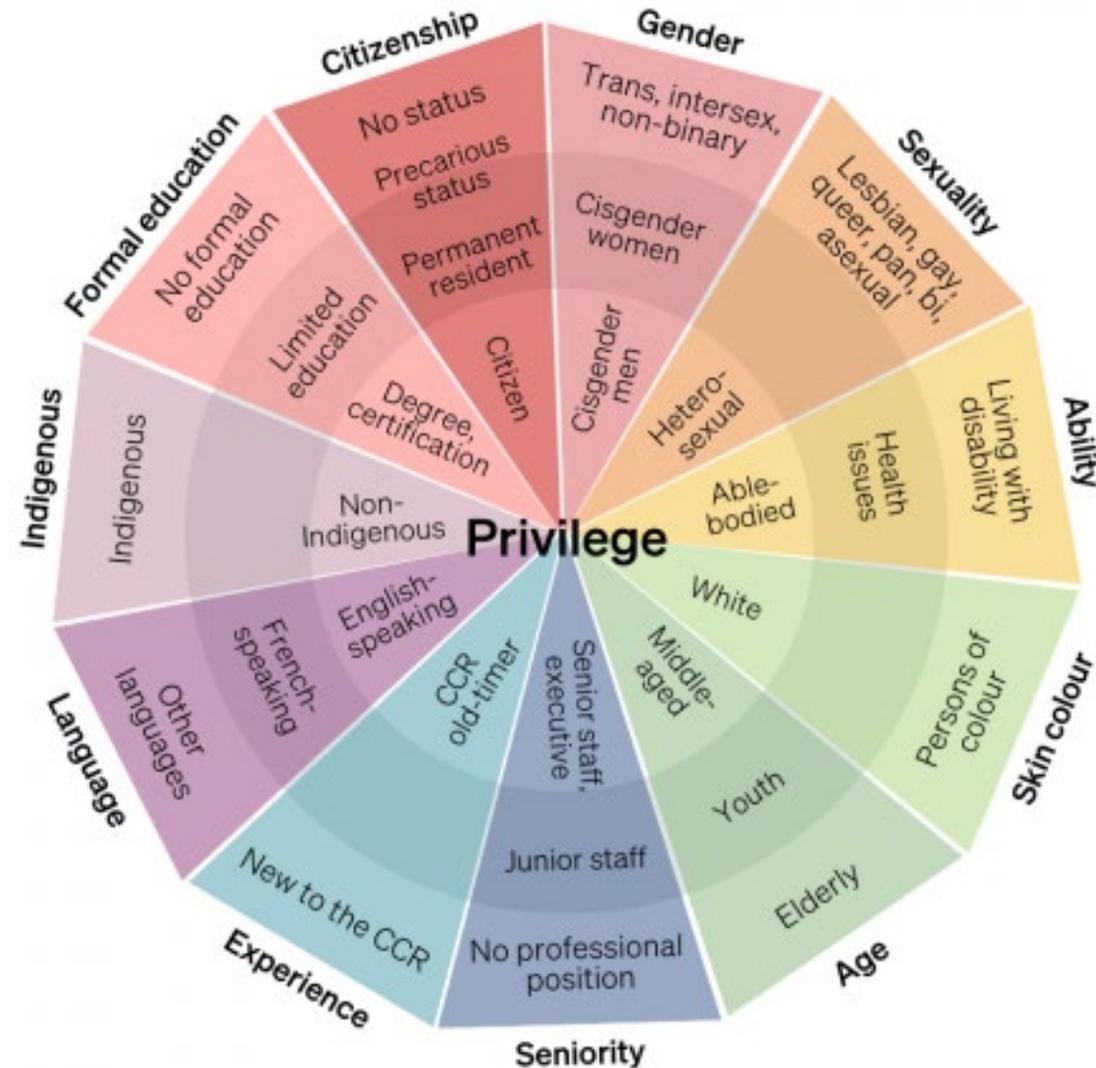
EDI resources

- New Frontiers in Research Fund (NFRF) – Best practices in EDI in research: https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/edi-eng.aspx

- NSERC – Guide for Applications: Considering EDI in your application: https://www.nserc-crsng.gc.ca/_doc/EDI/Guide_for_Applicants_EN.pdf

- NSERC – EDI considerations at each stage of the research process: https://www.nserc-crsng.gc.ca/NSERC-CRSNG/Policies-Politiques/EDI_guidance-Conseils_EDI_eng.asp

- Canada Research Chairs (CRC) – Creating an Equitable, Diverse and Inclusive Research Environment: A Best Practices Guide for Recruitment, Hiring and Retention: https://www.chairs-chaires.gc.ca/program-programme/equity-equite/best_practices-pratiques_examplaires-eng.aspx

- CRC – Limiting unconscious bias in recommendation letters: https://www.chairs-chaires.gc.ca/program-programme/referees-repondants-eng.aspx#bias

- Gender decoder – Finding subtle bias in job ads: https://gender-decoder.katmatfield.com/

EDI resources

- Faculty of Engineering:
  https://www.ualberta.ca/engineering/equity-diversity-inclusivity-decolonization/index.html

- UofA Office of the Vice-Provost (Equity, Diversity and Inclusion) – Education and Awareness
  https://www.ualberta.ca/equity-diversity-inclusion/guides-and-resources/index.html
  - Good resources on recruiting

- Equity, Diversity and Inclusion Module
  https://eclass.srv.ualberta.ca/enrol/index.php?id=87624
  - This module is the first in a series of modules that will provide information and guidance on how to better integrate EDI into policies, processes, practices, and interpersonal relations to create a more equitable, diverse, and inclusive campus for staff, faculty, and students.

- UofA Library EDI resources
  https://guides.library.ualberta.ca/edi

NFRF best EDI practices in research

	Clarifying questions for understanding challenges/opportunities	Examples of best practices to address identified barriers
Training and development opportunities	How are training and development opportunities, conferences, networking opportunities, etc., communicated to members of the research team? Is this communication open and transparent?	Establish procedures/policies for equitably distributing training and development opportunities to team members (conferences, publications, networking, etc.). Clearly communicate these procedures/policies to all team members.
Inclusion	When are team meetings and social events scheduled? Do they account for the schedules of members with family obligations...? Are social events inclusive by design (e.g., held somewhere accessible; consider those who feel uncomfortable in locations serving alcohol, scheduled at a time that allows participation of those with family responsibilities)?	Identify easily accessible and appropriate resources for team members, such as onsite child care with nursing rooms; gender-neutral washrooms; accommodations offices within the institution; multi-faith prayer and meditation rooms; accommodations for students, faculty and staff fasting during Ramadan; flexibility for taking leave for religious obligations, rituals, celebrations and ceremonies; ...

https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/edi-eng.aspx

NFRF best EDI practices in research

- **Examples include**:
  - Planning the team composition/communicating the opportunity
  - Recruitment process
  - Training and development opportunities
  - Mentoring
  - Inclusion

EDI in Research Design

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Discovery grants – Merit of the proposal

- Applicants are **required** to describe consideration of sex, gender, and diversity in research design (where applicable)

  - NFRF best practices in EDI in research:
    https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/edi-eng.aspx

  - Gender-based analysis plus (GBA+):
    https://women-gender-equality.canada.ca/en/gender-based-analysis-plus.html

  - Stanford's "Gendered Innovations" project:
    https://genderedinnovations.stanford.edu/

  - NSERC EDI considerations at each stage of the research process:
    https://www.nserc-crsng.gc.ca/NSERC-CRSNG/Policies-Politiques/EDI_guidance-Conseils_EDI_eng.asp

NSERC guide on integrating EDI considerations in research

This guide provides the research communities served by NSERC with information and resources to help include EDI considerations in their research... It consists of the following two sections:

- Section 1: Equity, diversity and inclusion considerations at each stage of the research process provides guidance on how to apply a critical EDI lens through the **planning of research** ... It focuses on the research itself.

- Section 2: Equity, diversity and inclusion considerations for research teams provides guidance for building and maintaining a high-performing diverse team...

In addition... this guide also includes a list of relevant resources... a list of references and a glossary ...

NSERC guide on integrating EDI considerations in research

EDI considerations in research	
EDI considerations at each stage of the research process	**EDI considerations for research teams**
Key questions: • How is the research planned and carried out? • Who are the research subjects? • Who is impacted by the research?	Themes explored: • Who works, collaborates and contributes to the research? • The research environment • Building and maintaining a high-performing, diverse team

NSERC guide on integrating EDI considerations in research

Example 1: The trouble with assuming a standard body size and type in auto safety testing

Crash test dummies used in auto safety testing commonly use what is assumed to be a ***standard adult male model*** that is simply scaled for varying heights and weights to account for people of all sizes. However, female bodies are not just a smaller version of a male body.

An analysis of automotive crash data from 1998 to 2008 in the United States revealed that, even after controlling for weight and body mass, the ***odds of being severely injured were 47% higher in belt-restrained female drivers*** than in belt-restrained male drivers involved in a comparable crash (Bose and Segui-Gomez, 2011).

The same is true for obese individuals and the elderly, who are at a greater risk of serious injuries in car crashes, as well as pregnant individuals who have a high risk of fetal injuries even in minor crashes (Schiebinger et al. 2011–2020).

Thus, inadequate critical reflection on implicit assumptions embedded in auto-safety testing—the tendency to assume a "standard" male body adequately represents all human bodies—has ***resulted in inequities for the majority of car users***. Missing from research are crash-test dummies that accurately model a diversity of bodies, in terms of their respective geometry, muscle and ligament strength, spinal alignment, dynamic response to trauma and mass distribution.

NSERC guide on integrating EDI considerations in research

Example 4: Taking women into account in the design of energy-efficient buildings

The regulation of temperatures inside buildings is based on a model of thermal comfort for which the primary variable is the metabolic rate of building occupants. This variable has been based on a standard value of metabolic rate, which represents the ***average male***.

By showing the effects of not considering female metabolic rate on thermal demand, Kingma and van Marken Lichtenbelt (2015) make a case for changing the current models of thermal comfort to one that is more inclusive. This work is a step forward not only in ***reducing the bias*** that overlooks female thermal comfort in office buildings, but also in helping to better predict building energy consumption.

More work is needed to create thermal comfort models that are more representative of all occupants by taking into account additional diversity factors such body weight and age.

Questions to consider in a proposal

- Are **sex** (biological) and/or **gender** (sociocultural) considerations taken into account in the research design, methods, analysis and interpretation, and/or dissemination of research findings?
- What about **ethnicity/country of origin/socioeconomic factors, diverse body types and disabilities, neurodiversity,** etc.?
- Is there diversity in the work consulted and referenced?
- Does the research engage or involve **Indigenous Peoples** using best practices and established guidelines?
  - Resources for Indigenous research at the link below

If "Yes": Describe how identity factors will be considered in your research.

If "No": Explain why identity factors are *not applicable* in your research.

https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/edi-eng.aspx

Questions?

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