CFSG
Chaire pour les femmes en sciences et en génie

# Equity, Diversity and Inclusion in Higher Education and Research

## What They Are and Why They Are Needed

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Québec

UNIVERSITÉ DE SHERBROOKE

# Equity, Diversity and Inclusion in Higher Education and Research: What They Are and Why They Are Needed

**Dr. Eve Langelier, Ph. D.**
Full Professor, Department of Mechanical Engineering, Université de Sherbrooke
Chairholder, NSERC Chair for Women in Science and Engineering (Quebec)

**Jade Brodeur**
Research professional for the NSERC Chair for Women in Science and Engineering (Quebec)

**Acknowledgments**

The NSERC Chair for Women in Science and Engineering (Quebec) thanks the following persons for their contributions to this project:

Bibiana Pulido
Brigitte Leduc
Fanny Eugène
Fatima Bousadra
Hélène Laurendeau
Joëlle Pelletier-Nolet
Karima Mokarram
Mélissa Goupil-Landry
Militza Jean
Sophie Brière
Sylvain Le May
Vincent Belletête

The completion of this project was made possible by our partners: the Natural Sciences and Engineering Research Council of Canada (NSERC), the Fonds de recherche du Québec – Nature et technologie (FRQNT), the Secrétariat à la condition féminine and the Université de Sherbrooke.

September 2020

# About the NSERC Chair for Women in Science and Engineering (Quebec)

The overall goal of the NSERC Chair for Women in Science and Engineering (Quebec) is to increase women's participation in science and engineering in Quebec. To achieve this goal, the Chair has divided its program into two components: an activities component and a research component.

The general objective of the activities component is to break down the often unconscious and unintentional barriers that girls and women face at various times in their lives and that limit their access to enjoyable careers in science and engineering.

The general objective of the research component is to analyze the current status of women in science and engineering in Quebec, and then evaluate potential solutions to help them advance in these fields.

In the activities and research that it plans to carry out during its first term, the NSERC Chair for Women in Science and Engineering (Quebec) will pursue the following specific objectives:

1. Demystify science and engineering;
2. Raise awareness of the impact that careers in science and engineering have on society;
3. Present women currently working in science and engineering as role models, to counter stereotypes;
4. Provide tools to support women who have chosen careers in science and engineering and sensitize the settings in which they work;
5. Support science and technology teachers in elementary and secondary schools;
6. Understand and report on the status of women in science and engineering in Quebec;
7. Develop strategies for recruiting and retaining female science and engineering students and professors in Quebec.

# Preface

"If you differ from me, you do not impoverish me, you enrich me."

– Antoine de Saint-Exupéry

In Quebec and the rest of Canada, as in the United States and Europe, there is a growing, broad-based movement to promote equity, diversity and inclusion (EDI) at all levels of government as well as in education and research institutions and private businesses. Internationally, this movement is expressed, for example, in United Nations Sustainable Development Goal 5: Gender Equality. Closer to home, it is expressed in the Quebec government's 2017-2022 strategy for research and innovation and in its strategy for gender equality by 2021 (Quirion, 2019). Equity, diversity and inclusion are increasingly incorporated into strategic plans and action plans. In short, there is a growing institutionalization of EDI and a greater formalization of EDI practices.

Institutions of higher education and research—both colleges and universities--are now seen as places for training, innovation, advancement and production of knowledge. From this perspective, they play a direct role in the development of contemporary society. If these institutions are to represent the interests of the entire community effectively, they must themselves promote values such as equity, diversity and inclusion and apply them in dealing with administrators, faculty, staff and students.

For colleges and universities to meet these societal expectations, they must develop and implement policies and strategies for advancing equity, diversity and inclusion. The present training program has been developed to help them do so. It uses examples and reference materials to raise awareness of these issues among administrators, faculty, human-resources professionals, research professionals and recruitment-committee members, among others. This program comprises four multimedia training modules and the present reference document, which you can download to consult whenever you like. This document is a support for the training offering enriched content based on scientific and professional publications. It can also be used as a reference for people who are delivering training on topics related to EDI. However, this document is not an exhaustive review of such publications; it is simply an introduction to EDI.

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# 1. Introduction

In April 2017, the Canadian Minister of Science and Sport, Kirsty Duncan, made remarks indicating her desire to improve equity and diversity in the awarding of Canada Research Chairs.

> *When I became Minister of Science, I made it clear that I expected the universities to meet the equity and diversity targets that they had agreed to meet a decade ago,* […]. *For the most part, they've failed to do so. It's been a decade, and there simply hasn't been enough progress.* (Hannay, 2019)

On May 10, 2017, the President of SSHRC, writing on behalf of the Steering Committee for the Canada Research Chairs Program, addressed an open letter to the presidents of the universities that participate in this program, confirming its commitment to equity, diversity and inclusion and imposing new requirements on the universities in this regard. This letter began as follows.

> *I am writing on behalf of the Steering Committee for the Canada Research Chairs Program (CRCP), as a followup to my communication of April of 2016 urging institutions to make concerted efforts to address the underrepresentation of the four designated groups (FDGs: women, Aboriginal Peoples, persons with disabilities and visible minorities) in their nominations for Canada Research Chair positions. Since that time, the results of the 15th-year evaluation of the program have confirmed that greater transparency and accountability in the processes used by institutions for the allocation and selection of chairholders is necessary to ensure that institutional equity and diversity targets are met. As part of its response to the 15th-year evaluation, the Steering Committee is pleased to share with you the CRCP Equity, Diversity and Inclusion Action Plan. The action plan focuses on improving the governance, transparency and monitoring of equity and diversity within the program. It includes actions that will support institutions in making swift progress towards meeting their equity and diversity targets, in addition to ensuring that the essential principles of equity, diversity and inclusion are strengthened within the program. These include additional institutional requirements, some of which must be met by October 2017, and the remainder of which are due for completion in December 2017. (Hewitt, 2017)*

One of these requirements was that institutions develop their own equity, diversity and inclusion action plans. This requirement was stated as follows in the CRCP Equity, Diversity and Inclusion Action Plan:

> *All institutions with five or more chair allocations will be required to develop an equity, diversity and inclusion action plan. This plan will guide their efforts in sustaining the participation of and/or addressing the underrepresentation (based on institutions' equity gaps) of individuals from the FDGs among their chair allocations. Institutions will be required to report publicly and to the program on the progress made in meeting their objectives on a yearly basis. The plan must include impactful equity, diversity and inclusion objectives that will enable swift progress towards addressing the disadvantages currently experienced by individuals from the FDGs in accessing and benefiting from the program. (CRC, 2018a)*

The present training program is designed to help institutions to develop and carry out these action plans. It is also designed to sensitize managers of colleges and universities and their faculties, departments and professors both to the positive impacts of diversity and to the challenges associated with it.

This training program has been developed to meet the CRCP's specific requirements regarding the allocation of Canada Research Chairs, but it can also be applied in other contexts, such as hiring and advancing the careers of educators and researchers at universities and other institutions of higher education and research.

## 1.1 Overall objective of this training program

This training program is designed to raise awareness of equity, diversity and inclusion so as to ensure greater representation and better integration of the four designated groups in higher education and research.

## 1.2 Specific objectives of this training program

The specific objectives of this training program are as follows:

1. To determine the situations that are representative of the concepts associated with EDI;
2. To briefly describe the current situation with regard to EDI;
3. To explain the importance of setting targets to achieve better deployment of EDI;
4. To define the benefits and potential challenges associated with diversity in higher education and research.

# 2. Key concepts

First of all, it is important to understand the concepts that are central to this training program.

## 2.1 Diversity

Diversity refers to a group of individuals who differ in their identity; geographic, cultural or religious origin; age, sex, gender or sexual orientation; academic discipline; or other characteristics. For example, UNSECO defines cultural diversity as follows:

> *"Cultural diversity" refers to the manifold ways in which the cultures of groups and societies find expression. These expressions are passed on within and among groups and societies. Cultural diversity is made manifest not only through the varied ways in which the cultural heritage of humanity is expressed, augmented and transmitted through the variety of cultural expressions, but also through diverse modes of artistic creation, production, dissemination, distribution and enjoyment, whatever the means and technologies used.* (UNESCO, 2005, p. 14)

For the purposes of this training program, the concept of diversity also includes individuals who have physical or intellectual limitations.

## 2.2 Designated groups

Designated groups are groups for which temporary remedial measures will be put in place to ensure better representativity (Government of Canada, 2016). In Canada, the federal Employment Equity Act designates four groups (women, Aboriginal peoples, persons with disabilities, and members of visible minorities) that face persistent barrier with regard to employment—for example, in hiring, promotion or career advancement in general (Employment and Social Development Canada, 2011). These four groups are also targeted in the Canada Research Chairs Program Equity, Diversity and Inclusion Action Plan (Council of Canadian Academies, 2012).

**The definitions of the four designated groups covered by Canada's federal Employment Equity Act are as follows (Government of Canada, 2016):**

**Women:** Any person who identifies as a woman.

**Aboriginal peoples:** An Aboriginal person is a North American Indian or a member of a First Nation, Métis or Inuit. North American Indians or members of a First Nation include treaty, status or registered Indians, as well as non-status and non-registered Indians.

**Persons with disabilities:** A person with a disability has a long term or recurring physical, mental, sensory, psychiatric or learning impairment and:

- considers himself/herself to be disadvantaged in employment by reason of that impairment;
- believes that an employer or potential employer is likely to consider him/her to be disadvantaged in employment by reason of that impairment.

**Members of visible minorities:** A person in a visible minority group is someone (other than an Aboriginal person as defined above) who is non-white in colour/race, regardless of place of birth. The visible minority group includes: Black, Chinese, Filipino, Japanese, Korean, South Asian-East Indian (including Indian from India; Bangladeshi; Pakistani; East Indian from Guyana, Trinidad, East Africa; etc.), Southeast Asian (including Burmese; Cambodian; Laotian; Thai; Vietnamese; etc.) non-white West Asian, North African or Arab (including Egyptian; Libyan; Lebanese; etc.), non-white Latin American (including indigenous persons from Central and South America, etc.), person of mixed origin (with one parent in one of the visible minority groups listed above), other visible minority group.

**The number of designated groups and their definitions vary from one jurisdiction and one funding agency to another. Here are brief discussions of the situations under Quebec legislation and at a number of Quebec and federal research-funding agencies.**

**Quebec legislation:** Quebec's Act respecting equal access to employment in public bodies identifies the following groups that are discriminated against in employment: women, handicapped persons, Aboriginal peoples, persons who are members of visible minorities and persons whose mother tongue is neither French nor English (Gouvernement du Québec, 2019). Quebec's Charter of Human Rights and Freedoms states that "Every person has a right to full and equal recognition and exercise of his human rights and freedoms, without distinction, exclusion or preference based on race, colour, sex, gender identity or expression, pregnancy, sexual orientation, civil status, age except as provided by law, religion, political convictions, language, ethnic or national origin, social condition, a handicap or the use of any means to palliate a handicap." (Éditeur officiel du Québec, 2019)

**NSERC:** In its Statement on Equity, Diversity and Excellence in Natural Sciences and Engineering Research, NSERC recognizes that equity has not yet been achieved for groups such as women, members of visible minorities, Indigenous people, people with diverse gender identities and people with disabilities (NSERC, 2017a).

**CIHR:** The CIHR website states that there are a number of potential groups/populations that may experience bias within CIHR's funding systems, and a number of variables that could contribute to potential inequities. According to preliminary analyses of internal data and the available literature, it is assumed that the factors below (gender, career stage, language, Indigenous status, and size and location of institution] could lead to biases against certain groups. These factors will be examined in the CIHR Equity Strategy." (CIHR, 2019).

**SSHRC:** In 2015, SSHRC committed to implement Gender-based Analysis Plus (GBA+) (SSHRC, 2018a), an analytic process for assessing how diverse groups of women, men and non-binary people may experience policies, programs and initiatives. The "plus" in GBA+ acknowledges that GBA goes beyond biological (sex) and socio-cultural (gender) differences. We all have multiple identity factors that intersect to make us who we are—factors such as race, ethnicity, religion, age, and mental or physical disability. GBA+ takes these many identity factors into account. To learn more, see https://cfc-swc.gc.ca/gba-acs/index-en.html.

**Fonds de recherche du Québec (the Quebec Research Funds):** The website of the Chief Scientist for these three funding agencies states that "As part of their 2018-2022 strategic planning, the Fonds de recherche du Québec (FRQ) are committed to strengthening the integration of the principles of equity, diversity and inclusion in scientific assessment." (Gouvernement du Québec, 2016). The website does not, however, identify the designated groups.

**Fonds de recherche du Québec – Nature et technologies:** The FRQ-NT recognizes that several groups still face obstacles to full participation in science and engineering. These groups include women, Indigenous persons, racialized persons, persons with disabilities, and members of sexual and gender minorities (FRQ-NT, no date).

It is important to note that the concept of designated groups is a collective one (Terrier, 2012). It refers to groups that encounter difficulties collectively. For example, compared with men as a group, women as a group are observed to experience more difficulties with regard to employment. But individually, some women may experience fewer such difficulties than some men do.

In the above illustration, the darkness of the shading for each individual represents the degree of difficulty that this individual experiences: the darker the shading, the greater the difficulty. As can be seen, on average, the shading is darker for women than for men. But some women are shown in light grey while some men are shown in black.

In conclusion, in order to determine whether a given group is experiencing difficulties—with regard to employment or to research funding, for example—data are required. That is why funding agencies establish voluntary reporting systems (also known as self-reporting or self-identification system). We will return to this subject later in this document.

## 2.3 Intersectionality

In the EDI context, intersectionality refers to intersections between designated groups and to the many disadvantages, such as barriers to employment, that people with traits of more than one such group have faced historically. For example, dark-skinned women often face greater challenges than light-skinned women, who in turn often face more challenges than light-skinned men.

The concept of intersectionality was developed by legal scholar Kimberlé W. Crenshaw to describe the combination of sexism and racism to which Afro-American women are subjected. She explains intersectionality as follows:

*Intersectionality is just a metaphor for understanding the ways that multiple forms of inequality or disadvantage sometimes compound themselves and they create obstacles that often are not understood within conventional ways of thinking about anti-racism of feminism or whatever social justice advocacy structure we have.* (NAIS, 2018)

It is also important to recognize that the realities experienced by the various designated groups and intersectional groups are not the same. Thus a person from one designated group cannot speak for all designated groups. For example, a light-skinned woman cannot express the reality of a dark-skinned woman.

## 2.4 Equality and equity

### Case Study

Justin and Felipe are two applicants for the same research position in a faculty of engineering at a university.

Justin did his graduate studies at a laboratory in this faculty and thus comes from the inside. He is thoroughly familiar with the faculty's research teams and the equipment and resources at their disposal.

Felipe comes from another country. Most of his information about this engineering faculty comes from the Internet. He has no contacts within the institution.

The faculty assesses both candidates according to the same criteria, in particular their vision of how they would fit into the institution.

Does this evaluation ensure:
- Equality?
- Equity?

**Answer:** Because both applicants are evaluated according to the same criteria, the evaluation ensures equality. For the evaluation to ensure equity, the institution could, for example, have evaluation questions with one set of expected answers for internal applicants and another for external ones.

Equality means that every individual has access to the same opportunities. For example, according to Status of Women Canada (2018), "gender equality refers to equal rights, responsibilities and opportunities for women, men and non-binary people."

However, the path for accessing these opportunities is not the same for everybody. Members of designated groups will often encounter more systemic barriers along the way. Systemic barriers are the "institutionalization of discrimination through policies and practices which may appear neutral on the surface but which have an exclusionary impact on particular groups, such that various minority groups are discriminated against intentionally or unintentionally." (MIHR, no date)

In the broad sense, equity refers to a feeling or perception of fairness with regard to a given situation. In the EDI context, equity refers to an approach to correcting historic disadvantages between groups. For example, UNESCO defines gender equity as follows: "Process of being fair to men and women. To ensure fairness, measures must often be put in place to compensate for the historical and social disadvantages that prevent women and men from operating on a level playing field. Equity is a mean. Equality is the result." (UNESCO Institute for Statistics, 2019).

Another example is the principle of pay equity. According to the CNESST (Quebec's commission for workplace standards, equity, health and safety), ensuring pay equity means ensuring that the pay for jobs traditionally held by women is equal to the pay for jobs traditionally held by men, even if these jobs are different, provided that they are of the same value or comparable value to the organization. The principle of pay equity goes further than the principle of equal pay for equal work, because it requires equal pay for work that is different but equivalent (CNESST, 2016).

Thus, equity is an approach designed to treat all individuals fairly by taking their particular situations into account and eliminating any systemic barriers. Universities take a variety of steps to ensure greater equity by increasing the transparency of decision-making processes and raising awareness of unconscious biases. The Canada Research Chairs define an unconscious bias as follows:

*An unconscious bias is an implicit attitude, stereotype, motivation or assumption that can occur without one's knowledge, control or intention. Unconscious bias is a result of our life experiences and affects all types of people. Examples of unconscious bias include gender bias, cultural bias, age bias, language and institutional bias. (CRC, 2018b)*

Unconscious bias can lead to discrimination, which the CDPDJ (Quebec's human rights commission) defines as distinction, exclusion or preference whose effect is to nullify or compromise the right to equality (CDPDJ, 2018). This commission defines the following three forms of discrimination:

- **Direct discrimination** occurs when someone is openly and admittedly subjected to different treatment on a prohibited ground of discrimination (Eid, Magloire and Turenne, 2011). For example, an employer who fires an employee after having been informed that he is a carrier of HIV is engaging in direct discrimination on the ground of a disability (CDPDJ, 2018).

- **Indirect discrimination** is generally unintentional. Instead, the discriminatory situation arises from the uniform application of a standard, policy, rule or practice that is seemingly neutral but nevertheless has a discriminatory impact on an individual or category of individuals by imposing obligations, penalties or restrictions on them that are not imposed on others. (CDPDJ, 2018). For example, if domestic animals are prohibited in a public place but no exception is made for guide dogs for the blind, the prohibition may be deemed discriminatory (CDPDJ, 2018).

- **Systemic discrimination consists of all the disproportionate exclusionary effects that result from the combination of prejudices and stereotypes (often unconscious) with policies and practices that are generally adopted without consideration of the characteristics of the members of the groups against whom discrimination is prohibited (CDPDJ, 2018).**

**For more information on the difference between equality and equity**:

- **Women and Gender Equality Canada (WAGE),** formerly a federal agency known as Status of Women Canada and now a full-fledged department of the Government of Canada, offers online training in Gender-Based Analysis Plus (GBA+). This training includes a video explaining the difference between equality and equity. It can be viewed at https://www.swc-cfc.gc.ca/gba-acs/course-cours/fra/mod02/mod02_02_01.html.

- **Emploi Québec** defines the terms "equality" and "equity" as follows (translated from French):

  **Equality:** The principle that all individuals enjoy the same rights and freedoms that are proclaimed and guaranteed by the Quebec Charter of Human Rights and Freedoms and the Canadian Charter of Rights and Freedoms. This principle also seeks to eliminate any form of discrimination on the grounds covered by these charters (Groupe Conseil Continuum, 2005).

  **Equity:** a principle based on the feeling of what is fair and what is unfair, above and beyond legal requirements. Equity takes the particular characteristics of individuals and groups into account in order to place them on an equal footing. It opposes applying standards uniformly and systematically without considering the differences and diversity within society. The principle of equity is invoked to avoid uniform application that would be tantamount to injustice (Groupe Conseil Continuum, 2005).

## 2.5 Inclusion

Inclusion means taking steps to establish an environment in which diversity is respected and all members of the community are fully integrated and supported in ways that promote their well-being and achievement. Inclusion means making a sustained commitment to welcome, integrate and support members of designated groups and help them advance.tre et leur accomplissement.

**Examples of inclusion:**

- Installing wheelchair ramps;
- Non-gendered designation of washrooms, so that they are accessible to everyone, regardless of what gender they do or do not identify with;
- Implementing strategies to support the recruitment and career advancement of members of designated groups;
- Establishing flexible work schedules to help parents and family caregivers;
- Adjusting schedules for evening and weekend social and training activities so that parents and family caregivers can participate;
- Adopting an inclusive teaching approach by giving students with special challenges more time to finish exams;
- Installing refrigerators in work and study areas so that nursing mothers can store their milk;
- Providing spaces for prayer

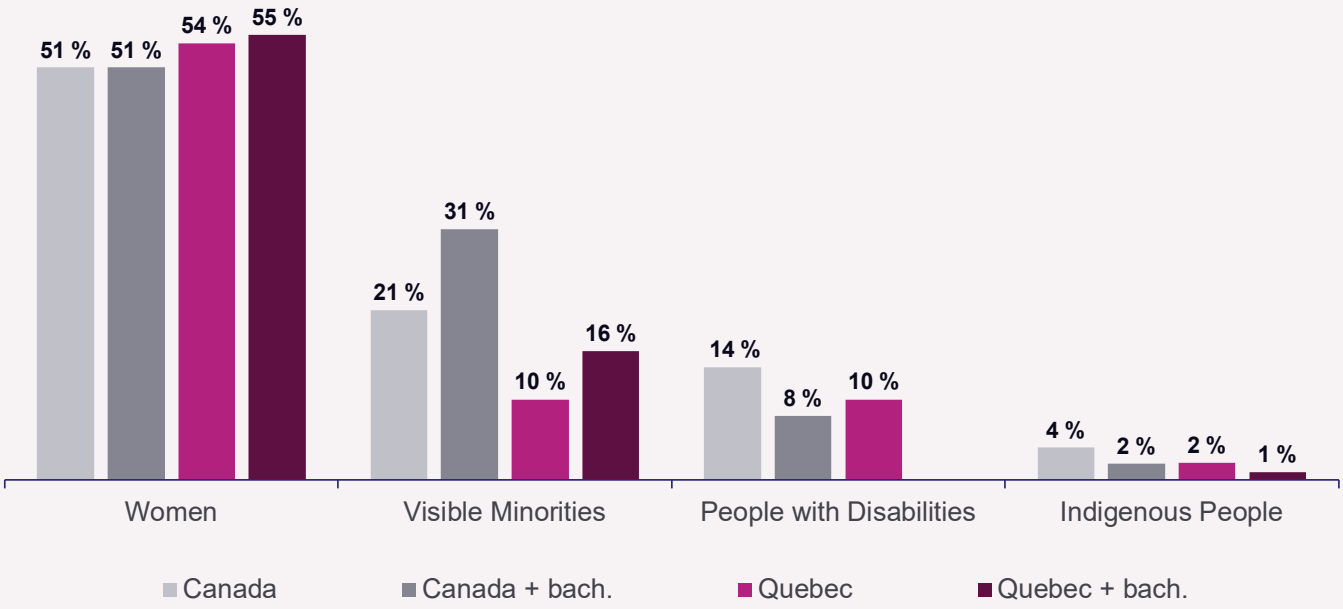
Please note that inclusive practices that work well in one place may lead to different results elsewhere. It is necessary to consider the particular context of each organization. Testing and adjustments may be necessary.

# 3. Current situation

To present a picture of the current situation in Quebec and the rest of Canada, we will discuss the current representation of women and other designated groups at universities. We will also present the self-identification form. To provide a broader picture, we will then describe a few initiatives being taken in Canada and other countries.

## 3.1 Representation of designated groups in Quebec and Canada

For the issues regarding under-representation of designated groups to be properly understood, it is essential first to provide a picture of the current situation.




Designated groups as a proportion of the populations of Canada and Quebec

Data from the 2016 Census and the Canadian Survey on Disability, 2012 (Statistics Canada)

The above chart shows the proportions of the populations of Canada and Quebec that each of the designated groups represents. To more closely reflect the situation at universities, this chart also shows the proportions that each group represents of all people in Canada and in Quebec who have bachelor's degrees. Here are the main observations.

- **Women**, in 2016, accounted for 54% of the total population of Quebec and 55% of all people in Quebec who have bachelor's degrees. *Note: As presented previously, women are regarded as a designated group that faces persistent barriers to employment, even though they represent a slight majority of the population.*

- **Members of visible minorities** represented a smaller proportion of the general population in Quebec than in Canada as a whole (10% compared with 21%). But they represented a higher proportion of the population with bachelor's degrees, both in Quebec (16%) and in Canada (31%).

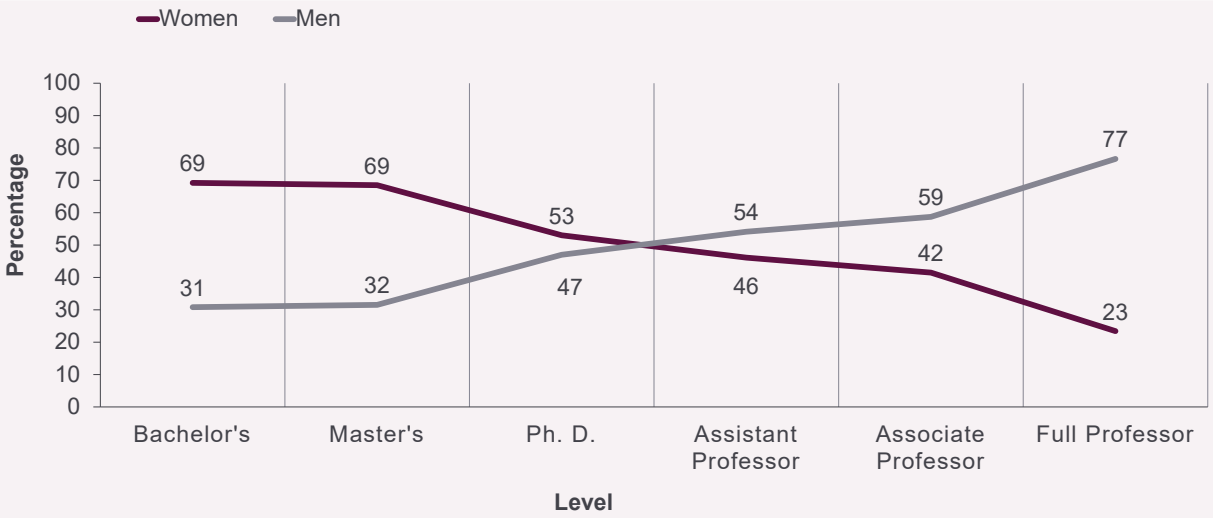
- **People with disabilities** represented a smaller proportion of the general population in Quebec than in Canada as a whole (10% versus 14%). In Canada, they also represented a smaller proportion of the population with bachelor's degrees than of the general population (8% versus 14%). Quebec does not record the number of people with disabilities who have bachelor's degrees, so no comparison between Quebec and Canada can be made in this regard.

- **Indigenous people** accounted for only small proportions of the total populations of Quebec and Canada (2% and 4%, respectively), and even smaller proportions of the populations with bachelor's degrees (1% and 2%).

EDI issues go far beyond mere statistics, but these statistics do show that about 65% of all people in Quebec are members of at least one designated group that faces barriers to employment.

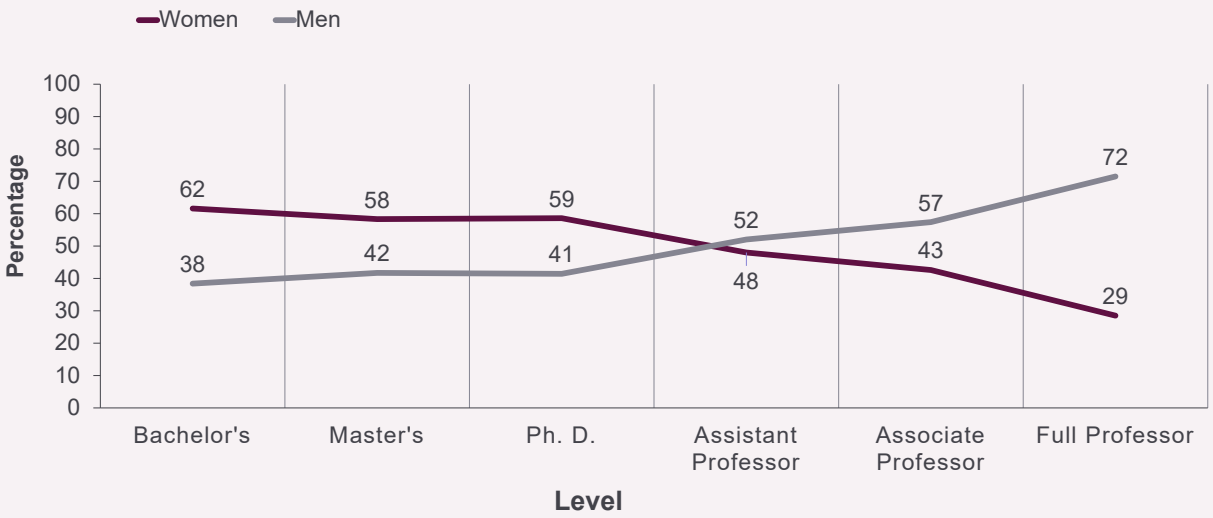
## 3.2 Representation of women at Canadian universities

The following charts show the percentages of women and men at various levels of education and academic ranks in various fields (NSERC, 2017b; Council of Canadian Academies, 2012).




Percentages of women and men at various academic levels in the life sciences, 2008-2009

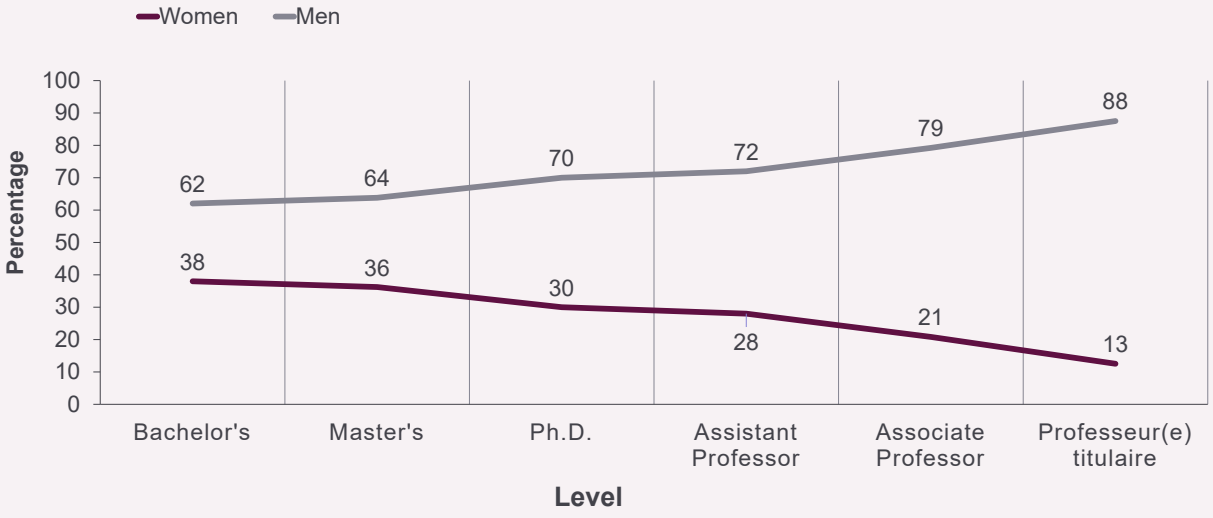
Figure adapted from Council of Canadian Academies, Expert Panel on Women in University Research. *Strengthening Canada's Research Capacity: The Gender Dimension*, 2013.




Percentage of women and men at various academic levels in the humanities, social sciences and education, 2008-2009

Figure adapted from Council of Canadian Academies, Expert Panel on Women in University Research. Strengthening Canada's Research Capacity: The Gender Dimension, 2013.

In the life sciences, humanities, social sciences and education, women start out as the majority of the student population, but then their numbers decline while men's numbers rise, so that men account for a majority of professors. The higher the academic rank, the lower the percentage of women, so that they have less of a presence at the levels where decisions about teaching and research priorities are made.




Percentage of women and men at various academic levels in the natural sciences and engineering, 2010-2011

Figure adapted from Corporate Planning and Policy Division, NSERC. *Women in Science and Engineering in Canada*, 2017.

In contrast, in the natural sciences and engineering, women are a minority from the bachelor's level onward. Once again, among faculty, women's representation declines as academic rank increases.

To date, universities and funding agencies have not done as good a job in tracking data on the other designated groups, which is why only the data on women's representation are presented here. But such data on these other groups are highly relevant for assessing the difficulties that they encounter.

In order to better understand their situation and identify the systemic barriers that they face, data are needed to determine the correlations between the various groups' representation and their career advancement, the amount of research funding that they obtain, their success rates in grant competitions, and so on.

## 3.3 Self-identification

As of summer 2018, the Social Sciences and Humanities Research Council (SSHRC) and the Natural Sciences and Engineering Research Council (NSERC) ask all applicants for funding competitions (grants, scholarships, and fellowships) to self-identify with information on their age, gender, Indigenous identity, and status as a member of a visible minority group or person with a disability (Government of Canada, 2019a).

The Canadian Institutes of Health Research (CIHR) have also recently begun to implement this requirement. (Government of Canada, 2019a). Thus this information will eventually become available. It will enable these funding agencies to examine whether or not the various groups are experiencing extra challenges in seeking research funding.

COMMENTS

- The data provided through self-identification are confidential. For example, they cannot be shared with reviewers of funding applications. In addition, when correlation findings are released, these data are aggregated in such a way that the individuals concerned cannot be identified by deduction.
- The data from voluntary self-identification often lead to underestimates of the actual figures, because some people—for example, people living with psychological challenges—may fear being stigmatized if they self-identify.
- In any process for measuring representation of designated groups, it is essential to respect self-identification as an individual process of recognizing one's identity. For example, in everyone else's eyes, someone may seem to be a member of a visible minority, but this person may or may not identify as such.

## 3.4 EDI initiatives in Canada and others countries

The present training program, Equity, Diversity and Inclusion in Higher Education and Research: What They Are and Why They Are Needed, was developed to meet the requirements of the Canada Research Chairs Equity, Diversity and Inclusion Action Plan. But the scope of this training program extends beyond this action plan, and so this program must be placed in a broader context.

Other federal and provincial funding agencies in Canada are developing EDI strategies and action plans. For example, the Natural Sciences and Engineering Research Council (NSERC) is overseeing a pilot program called Dimensions: Equity, Diversity and Inclusion Canada (NSERC, 2019). The Canadian Institutes of Health Research has CIHR's Equity Strategy (CIHR, 2019). The Social Sciences and Humanities Research Council (SSHRC), in its 2018-2019 departmental plan, states that "SSHRC is committed to ensuring that its funding opportunities are accessible to the largest possible pool of qualified candidates as a means to support and advance excellence in Canadian research." (SSHRC, 2018b). In addition, SSHRC grant applications how have a section dealing exclusively with equity, diversity and inclusion, where applicants must describe the concrete steps that they will take to encourage diversity with regard to the following three points: the composition of their team and their training activities, their recruitment process, and inclusion. Quebec's three research-funding agencies (the Fonds de recherches du Québec), in their 2018-2022 strategic plans, state their commitment to "strengthening the integration of the principles of equity, diversity and inclusion in scientific assessment" (Gouvernement du Québec, 2016). These agencies have drawn inspiration from efforts elsewhere in the world. In the United Kingdom, the Athena-SWAN program (UK Equality Challenge Unit, 2019) seeks to advance gender equality in science, technology, engineering, mathematics and medicine. Participating institutions that demonstrate their commitment to achieve these objectives, as determined by self-assessments, peer assessments, and continued progress, are awarded bronze, silver and gold medals. These medals are awarded for a limited term. Renewals are based on assessments of progress and of successful completion of preceding action plans. In their evaluation of this program, Munir et al. (2014) state that the majority of the universities that have been awarded medals have reported positive impacts on gender issues. Some have also observed positive changes in terms of staff recruitment. The Athena-SWAN program is now being deployed in other countries, including the United States, through the STEM Equity Achievement (SEA Change) workshop project (NSF, 2016) and in Australia through the Science in Australia Gender Equity (SAGE) initiative (SAGE, 2019). NSERC's Dimensions: Equity, Diversity and Inclusion Canada pilot program used the Athena-SWAN program as a model.

Canadian federal and provincial governments also use strategies to achieve greater gender equality. For example, the Quebec government uses gender-based analysis (GBA), while the Government of Canada uses Gender-based Analysis Plus (GBA+) (SCF, 2017). There is also Sex- and Gender-based Analysis (SBGA), which is "an analytical process used to assess how diverse groups of women, men, girls, boys and gender-diverse people may be impacted by federal initiatives (Government of Canada, 2019b). There is also a framework of laws that must be obeyed. In Quebec, for example, the Act respecting equal access to employment in public bodies (Gouvernement du Québec, 2019) establishes a special framework to provide equal access to employment in all public bodies that employ 100 people or more. The purpose of this framework is to remedy the employment discrimination experienced by women, disabled persons, Indigenous people, people who are members of visible minorities because of their race or the colour of their skin, and members of

ethnic minorities whose mother tongue is neither French nor English and who are neither Indigenous nor members of a visible minority.

There is also Quebec's Charter of Human Rights and Freedoms. The sections of this Charter that relate to equity, diversity and inclusion read as follows.

1: Every human being has a right to life, and to personal security, inviolability and freedom. He also possesses juridical personality.

10: Every person has a right to full and equal recognition and exercise of his human rights and freedoms, without distinction, exclusion or preference based on race, colour, sex, gender identity or expression, pregnancy, sexual orientation, civil status, age except as provided by law, religion, political convictions, language, ethnic or national origin, social condition, a handicap or the use of any means to palliate a handicap. Discrimination exists where such a distinction, exclusion or preference has the effect of nullifying or impairing such right.

16: No one may practise discrimination in respect of the hiring, apprenticeship, duration of the probationary period, vocational training, promotion, transfer, displacement, laying-off, suspension, dismissal or conditions of employment of a person or in the establishment of categories or classes of employment.

18.1: No one may, in an employment application form or employment interview, require a person to give information regarding any ground mentioned in section 10 unless the information is useful for the application of section 20 or the implementation of an affirmative action program in existence at the time of the application.

86: The object of an affirmative action program is to remedy the situation of persons belonging to groups discriminated against in employment, or in the sector of education or of health services and other services generally available to the public. An affirmative action program is deemed non-discriminatory if it is established in conformity with the Charter.

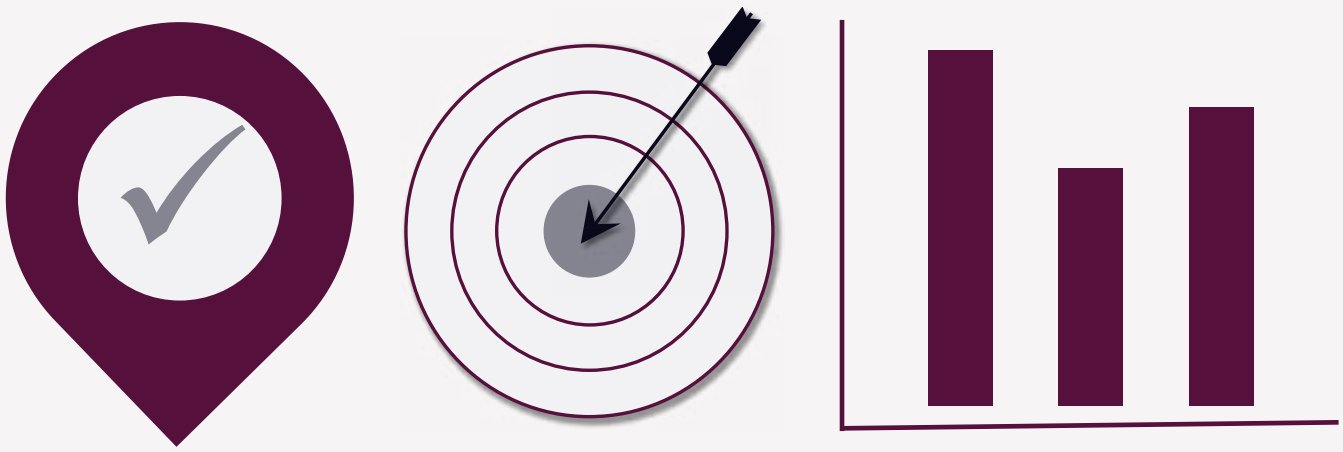
Lastly, in the United States, if you apply for a position as a professor at a university, you will probably have to provide a diversity statement (University of Nebraska-Lincoln, 2019). This is a document explaining the applicant's experiences and commitments with regard to diversity. It is a relatively new addition to employment applications for professors, and the reason behind it is the universities' desire to support the inclusion of the diverse population of the United States.

# 4. Why set EDI Targets?

In general, when we want to achieve a goal in our personal lives (for example, to run five kilometres in less than 25 minutes) or in an organization (for example, to recruit five per cent more students at a university), we have to define objectives, targets and indicators in order to initiate that change. Equity, diversity and inclusion are no exception. In this section, we discuss why objectives, targets and indicators are needed in order to achieve EDI. We also present the origin of the targets that the Canada Research Chairs have set to encourage EDI.

## 4.1 The objectives-targets-indicators triad

To ensure that our goals are achieved and lead to concrete results, it is desirable to associate them with objectives, targets and indicators. This is what is called the objectives-targets-indicators triad.




The information in this section is taken from a Quebec government document entitled Modernisation de la gestion publique : Guide sur les indicateurs (D'Auteuil, 2003), but we have added examples specifically for this training program.

If an organization wants to implement a change:

- It expresses its intent through an **objective**;
- It expresses the level of the desired result through one or more **targets**;
- It measures the result actually achieved by means of one or more **indicators** and compares it with the target to assess the progress toward the achievement of the objective.

**Example 1**

| | |
|---|---|
| **Objective** | Increase the number of professors from the designated groups |
| **Target** | Increase representation by 5% compared with 2017-2018 |
| **Numerical indicators for *quantitative* results** | Obtained by methods such as self-identification:<br>• Percentage of professors from the designated groups in 2018-2019<br>• Percentage of women in teaching faculty in 2018-2019<br>• Percentage of Indigenous people in teaching faculty in 2018-2019 |

**Example 2**

| | |
|---|---|
| **Objective** | Increase the feeling of inclusion among members of the designated groups |
| **Targets** | • 40% of members feel very included<br>• 50% of members feel somewhat included<br>• 10% of members do not feel included |
| **Numerical indicators for *qualitative* results** | Obtained by means of a survey:<br>• Percentage of members who feel very included<br>• Percentage of members who feel somewhat included<br>• Percentage of members who do not feel included |

## 4.2 Indicators

The information in this section is taken from a Quebec government document entitled Modernisation de la gestion publique : Guide sur les indicateurs (D'Auteuil, 2003), but we have added examples specifically for this training program.

In most of the member countries of the Organization for Economic Cooperation and Development (OECD), government organizations use indicators to evaluate performance through the achievement of objectives as well as other administrative dimensions. In academic institutions, funding agencies and research centres, indicators can be used to assess the implementation and effectiveness of EDI action plans, for example.

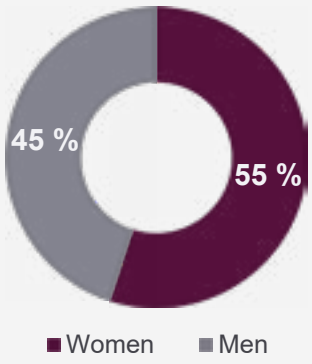
The Secrétariat du Conseil du trésor du Québec defines an indicator as any significant measurement, whether relative or absolute, that is used to assess results obtained, utilization of resources, progress of work or the external context (D'Auteuil, 2003). In other words, an indicator is used to evaluate the level of achievement of a target.

An indicator can be numerical, to express quantitative results such as a quantity, a cost, or an amount of time. In the EDI context, one example of a quantitative result is the representation of the designated groups within the teaching faculty (percentage of women, percentage of persons identifying as members of visible minorities, etc.). Numerical indicators can also be used to report qualitative results, such as a satisfaction rate or a feeling of inclusion (percentage of people who feel very satisfied, percentage of people who do

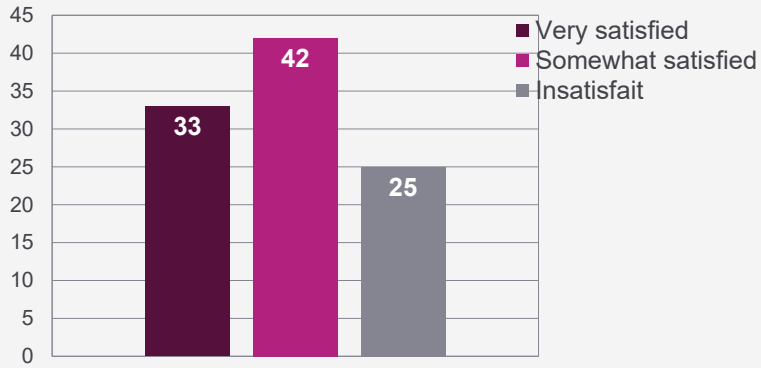
not feel included).

An indicator can also be non-numerical, to express results that are intangible or non-quantifiable. Two examples would be the submission of an action plan and the development of a survey.

Numerical indicators
Quantitative results

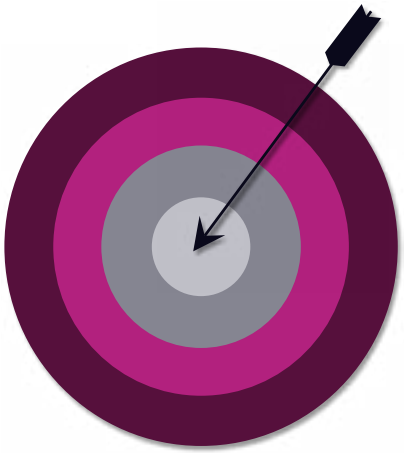



Numerical indicators
Qualitative results




## 4.3 The need for targets

In 2017, the Canada Research Chairs set targets for Canadian universities to achieve over a time horizon of 18 to 24 months (CRC, 2018c). Setting targets is an appropriate practice. At Gender Summit 11 North America, an event attended by more than 675 advocates of gender equality in science, innovation and development, one of the conclusions reached was the need to define indicators and set and regularly adjust targets. Without defined targets, there will be no results.



At this same summit, Yves Desjardins-Siciliano, then President and CEO of VIA Rail, expressed this explicitly:

> *My first point is if we want diversity and inclusion to happen, we need leadership.* […] *You have to have an objective, state it clearly and enforce it.* […] *Objective setting and measurement matters because what doesn't get measured doesn't get done. (CPAC, 2019)*

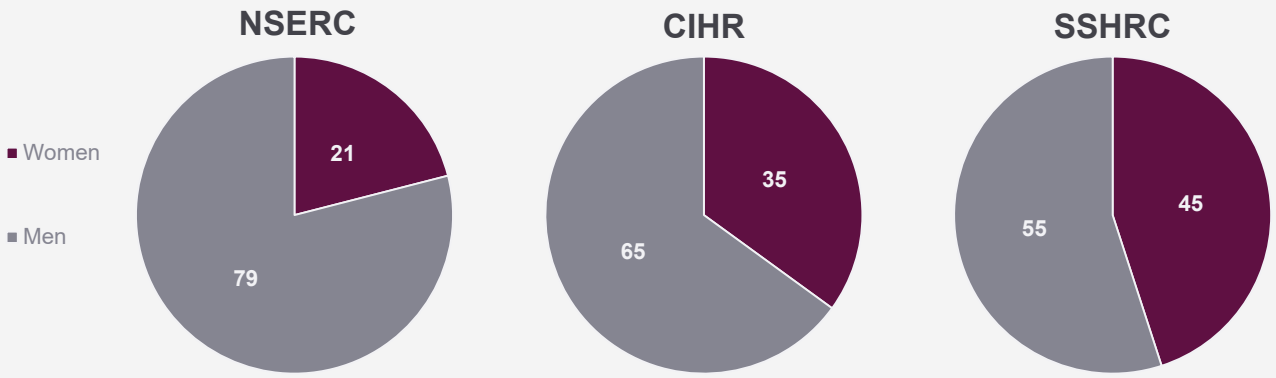
Mr. Desjardins-Siciliano put his strategy into practice at his own firm (CPAC, 2019). VIA Rail set targets for women, members of the armed forces, veterans, Indigenous people and LGBTQ2+ people (lesbian, gay, bisexual, transgender, queer, two-spirited and other identities).

In 2014, under Mr. Desjardins-Siciliano's leadership, VIA Rail's measured indicators exceeded the targets set for them, except for members of the armed forces, who are harder to recruit. In addition, this corporation, 60% of whose customers are women, set itself the objective of better representing its users and the public by requiring that half of its internal managers be women. The composition of the board of directors, which was two women and eight men at the time, had changed to six women and five men by the time that Gender Summit 11 North America was held. Meanwhile, the composition of the Executive Council went from eight men and no women to five men and four women. Lastly, the representation of women in executive positions rose to slightly more than 30% from 10%.

It should also be noted that a strategy relying solely on quantitative targets such as the percentage of CRC chairholders who are women remains insufficient. It is also necessary to set qualitative targets regarding inclusion, career advancement and well-being.

## 4.4 Quantitative targets set by the Canada Research Chairs to promote EDI

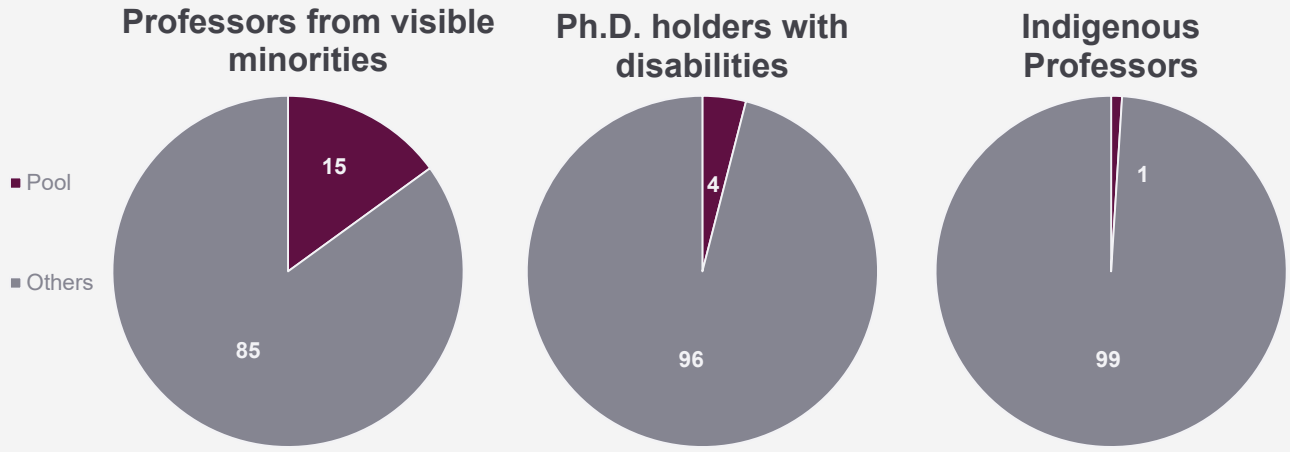
In 2017, to define the pools of potential female candidates for Canada Research Chairs and hence the targets to achieve in the awarding of these chairs, the CRC program chose as an indicator the percentage of women among applicants for NSERC Discovery Grants, CIHR Open Operating Grants and SSHRC Insight Grants. The corresponding figures were 21% in natural sciences and engineering, 35% in life sciences and 45% in social sciences, humanities and education.




## Participation women in competitions of the three federal granting agencies

Data taken from the following competitions; NSERC Discovery Grants (2011-2012, 2012-2013 and 2013-2014); CIHR Open Operating Grants (2011-2012, 2012-2013 and 2013-2014); SSHRC Insight Grants (2011-2012, 2012-2013 and 2013-2014).

For the other designated groups, the CRC program determined the pools of potential candidates for Canada Research Chairs on the basis of the available data. For Indigenous people and members of visible minorities, these pools were composed of university professors who had made voluntary self-identifications. For people with disabilities, it was composed of people with doctoral degrees who had made voluntary self-identifications.




## Availability pools used to set each target

Data from the *CAUT Almanac of Post-Secondary Education in Canada 2006* (Canadian Association of University Teachers) and the *Employment Equity Data Report* (Human Ressources and Skills Developent Canada).

Just recently, the Chairs program set new targets to be met by December 2029 (CRC, 2019). This initiative comes under the 2019 Addendum to the 2006 Canadian Human Rights Settlement Agreement. It is part of an ever-growing effort to "increase institutional targets for representation of women, visible minorities (members of groups that are racially categorized), persons with disabilities, and Indigenous peoples (the 'Four Designated Groups' or 'FDG')" (CRC, 2019). In setting the new targets, the program will no longer use the same methods. For example, it will no longer use the indicator of the representation of women among grant applicants, but rather will be based on 2016 census data on the overall percentage of women in the Canadian population. The same principle will apply for visible minorities. The targets are 50.9% for women and 22% for visible minorities. The target for Indigenous peoples is 4.9% since it is also based on 2016 census data. However, this percentage may change following planned discussions with representatives of Indigenous communities. For persons with disabilities, the target is 7.5% and "shall be subject to review and revision by five years from the signing of this Addendum, to assess progress" (CRC, 2019). Over the 10 coming years, institutions are encouraged to gradually establish these new targets, with the ultimate goal of attaining them by December 2029.

# 5. Benefits of diversity in higher education and research

In today's world, developing equity, diversity and inclusion in higher education and research is essential to enable all citizens to help to build first an ecosystem in our institutions and then a society that is more open, creative, productive and representative. In addition, developing equity, diversity and inclusion is "profitable". This subject is addressed in the following section.

## 5.1 Presence of role models

Professors, lecturers and teaching assistants are role models for their students. The presence of role models from the designated groups helps to break down the stereotypes that individuals must face.

In this regard, Shari Graydon reports a revealing example (Graydon, 2016). Vigdis Finnbogadottir was the President of Iceland from 1980 to 1996. One day during the last year of her presidency, she and her grandson were watching a television news piece about the candidates to replace her in the upcoming election, and her grandson exclaimed, *"But Grandma, they can't be president! They're men!" Her grandson assumed that the president had to be a woman, because that was the only kind of president he had ever known.*

Iris Bohnet recalls that, in 1993, the government of India amended its constitution so that henceforth. one-third of the members of village councils had to be women (Bohnet, 2016). The impacts were noteworthy:

- Parents changed their aspirations for their daughters' careers;
- Girls did less housework and wanted to wait longer before marrying;
- Other women began speaking up more at village meetings.

In higher education, students can identify more easily with role models who are like them. To test this assumption, a survey was conducted of 1215 female and male professors in departments offering doctorates in information science, chemistry, electrical engineering, microbiology and physics. This survey showed that the female professors supervised more female students than the male professors did (Fox, 2003). We can therefore assume that female professors are more likely to encourage female students to pursue graduate studies, because these students identify with them.

To illustrate the importance of the presence of role models in universities, Isabelle Desgagné-Penix, a biochemist of Innu origin who is a professor and researcher at the Université du Québec à Trois-Rivières (UQTR) talks about her career in a podcast (Québec Science, 2019). She says that when she began her studies, she never dared to reveal her Innu background, for fear that other people would judge her. But now, she is proud of this background and of how it has influenced her research. She says that she often hears from both female and male students who also have Indigenous backgrounds and want to confide in her. She has become a role model for them. Thus, Professor Desgagné-Penix highlights her culture in her work and thus seems to attract a larger pool of students.

Marie-Dominique Duval, a lecturer at the Université de Sherbrooke, participated in a video entitled La grande université humaine that this university has produced and put on line (Université de Sherbrooke, 2019). In this video, she says that she is a role model for students who are LGBTQ2+. Because she is a lesbian herself, many students confide in her. That is why she talks about her homosexuality openly.

The preceding examples clearly show that the presence of role models can strongly influence individual students and the student community, and that it influences the way young people see the world and the career choices that they make. More specifically, these examples show that all of us can play the role that suits us in society, such as studying and succeeding in a given field. As the saying goes, seeing is believing!

## 5.2 Wider range of concerns

Our identify affects what concerns us, what is important to us, and what things we want to take action on. Hence members of designated groups may show different concerns and take interests in different issues.

Here is an example taken from the media and reported by Shari Graydon (Graydon, 2016). A study has shown that certain topics receive less attention in journalistic publications, or more specifically, in opinion pieces, when women do not publish. Therefore, in most cases, women and men do not show the same degrees of concern for the same subjects. The above graphic shows the topics that are more addressed


Picture adapted from the book by Shari Graydon

by women in opinion pieces. The larger the characters in which a word appears in this graphic, the greater the difference in the occurrence of topics discussed by women and by men. As can be seen, the subjects dealt with the most often by women are women, need, people, the law, and families.

Once again, the podcast interview with Professor Desgagné-Penix provides revealing insights into the benefits of diversity in higher education and research (Québec Science, 2019). She describes her own journey from childhood to adulthood, then tells how her Innu background influences her current research interests. As a child, she developed an interest in medicinal plants while taking long walks with her grandmother in the forest. Now she attempts to develop medications from medicinal plants in the research laboratory that she heads at the Université du Québec à Trois-Rivières. Thus she has drawn inspiration from the traditional knowledge passed on by her grandmother to develop her research in the field of biotechnology.

As can be seen, a workplace that values equity, diversity and inclusion better represents the interests of all citizens. On a smaller scale, an institution that values equity, diversity and inclusion encourages its faculty and graduate students to investigate new kinds of research questions.

## 5.3 More diverse student body

Greater diversity among teaching faculty at institutions of higher learning results in greater diversity in scholarly and research projects, which in turn can attract a broader pool of students. In mechanical engineering, for example, researchers need not confine themselves to things like vehicles, turbines and structures, but can also investigate applications of technology to health care.

For instance, Isabelle Villemure, a professor and researcher at Polytechnique Montréal, studies mechanical regulation of growth and development of bone tissues in order to apply the resulting knowledge to the clinical treatment of progressive musculoskeletal pathologies in children and adolescents (Polytechnique Montréal, 2019).


These two x-ray images help to explain Professor Villemure's research. The left-hand image shows a particular kind of musculoskeletal pathology that she investigates: scoliosis (a sideways curvature of the spine). The right-hand image shows a patient in whom this condition has been treated by the traditional method of implanting rods to try to straighten the spine.

Among other things, Dr. Villemure works on designing minimally invasive implants (designing and characterizing in vivo new treatments based on optimized growth modulation for the correction of progressive pediatric skeletal deformities) (Polytechnique Montréal, 2019). Many female students are interested in such applications of technology in the health field. Thus a more diverse teaching faculty can make it easier to recruit graduate students.

## 5.4 Greater development of students' skills

The literature contains a number of studies examining the impact of ethnic and cultural diversity on the skills that students develop. Here are some of the findings.

One study found that students who experienced greater cultural diversity and participated in diversity-related activities at university showed greater involvement in active-reflection processes, greater intellectual engagement, increased motivation and greater skills (Gurin, 1999).

Another study showed that this kind of diversity forced students to confront their prejudices and stereotypes, broadened their perspectives and stimulated their critical thinking (American Council on Education and American Association of University Professors, 2000). According to faculty members surveyed at a wide variety of universities, being taught in diverse classrooms enriched the academic experience of white students.

## 5.5 Improved ability to solve problems and make predictions

Scott E. Page, a professor of complex systems, political science and economics at the University of Michigan, has developed a model in which he applies "cognitive diversity" to the solving of problems (in any field) and the making of predictions, both of which are activities that require an intellectual contribution (Page, 2007). In fact, according to Page, over the years every individual develops his or her own unique toolkit for solving problems and making predictions. This section is devoted to that topic.

### 5.5.1 Cognitive diversity as a solution to problem-solving and decision-making

Cognitive diversity is considered a benefit of equity, diversity and inclusion in academic settings and in society in general, because it is a strength that the group brings to solving problems and making predictions. For example, the greater the cognitive diversity within a group, the more likely that group is to be able to solve a complex problem. The principle is that the members of the group must think about and process information differently in order to expand the range of possible strategies. In fact, each member of the group contributes differently to the solving of a problem, according to the differing perspectives and experiences that this individual has acquired by virtue of his or her academic discipline (business vs. engineering vs. biology, etc.) and his or her identity (gender, culture, disability, etc.). In short, the members of the group complement one another.

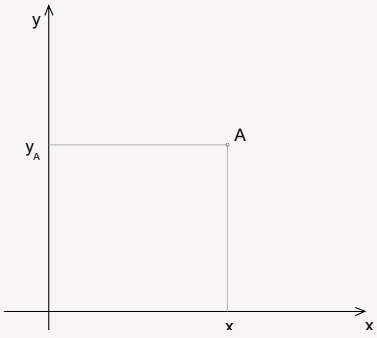
### 5.5.2 The problem-solving and prediction-making toolkit model

Over the years, every individual develops his or her own unique toolkit composed of perspectives, heuristics, interpretations and predictive models that are his or hers alone. In a group, the more variation there is from one individual's toolkit to another, the more complementary tools the group will have at its disposal for solving problems and making predictions. Thus, compared with a more homogeneous team, a team whose members come from a variety of academic disciplines and have a variety of identities will have greater cognitive diversity—a broader range of tools for solving problems and making predictions. To make this model more understandable, we will now explain each of the families of tools that this toolkit may contain.

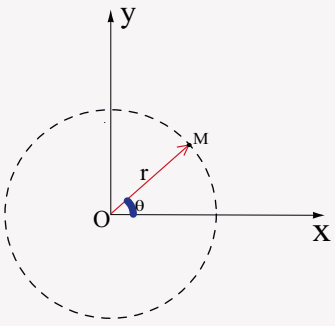
#### 5.5.2.1 Perspectives

Perspectives are points of view or ways of seeing and representing situations and problems. Consider the problem of depression. Depression can be seen from a biological, medical, psychological or sociological perspective. Each of these perspectives looks at this same complex problem from a different angle, asks different questions about it and thus helps to increase and diversify the ways of addressing it. Also, for certain problems in the natural sciences and engineering in particular, the choice of one representation rather than another can help to make the problem easier to solve. For example, systems of Cartesian coordinates (x,y) and polar coordinates (r,θ) are two different ways of representing points in Euclidean space. For problems such as navigating an aircraft or modelling the movement of a pendulum (a weight hung from and swinging freely around a fixed point), it is much easier to use the perspective that a system of polar coordinates provides. But for other kinds of problems, a system of Cartesian coordinates will be more effective.

*As shown in the left-hand graph below, in Cartesian coordinates, the position of a point A is given by the abscissa (the horizontal distance xA  from the y axis) and the ordinate (the vertical distance yA t from the x axis (Coordonnées cartésiennes, no date). As shown in the right-hand graph, in polar coordinates, the position of point M is defined by the distance r and the angle ϑ (Coordonnées polaires, no date).*




System of Cartesian coordinates




System of polar coordinates

Demonstrations of systems of Cartesian coordinates (Coordonnées cartésiennes, no date) and polar coordinates (Coordonnées polaires, no date)

The important thing to remember is that in general, the more perspectives a group has, the more tools it has for solving a problem.

### 5.5.2.2 Heuristics

Heuristics enable people to find solutions to problems. More precisely, individuals develop internal algorithms that help them to solve problems and make predictions (Bédard, Déziel and Lamarche, 2006). Then these algorithms develop according to each individual's education and experience (Bédard, Déziel et Lamarche, 2006).

Scott E. Page says that in the solving of problems and the making of predictions, heuristics are applied in conjunction with perspectives. An individual has a unique perspective on or understanding of a phenomenon, whereas a heuristic tells that individual where to look for new solutions or what steps to take to solve a problem.

The following concrete example involves a problem experienced by a Paralympic downhill skier who wore hand and foot prostheses and found that he was taking too "seated" a position as he skied. To maximize the performance of the ski, a skier must position and move his or her centre of mass within an area that is centred relative to the ski binding. The skier's coaches saw this problem from a geometric perspective and proposed to correct the skier's position by rotating him in space while changing the angle of his foot prostheses. But the engineers working with the ski team saw the problem from a physical perspective and proposed to correct the position of the skier's centre of mass by balancing the moments of force differently and therefore by reducing the mass of his hand prostheses. This example shows that every discipline has its own heuristics and that collaboration among several disciplines can be a great help in finding solutions to complex problems.

We can deduce that, in the research context, heuristics is more accurately described as a way of thinking and solving problems according to a specific discipline. As Lazure (1990) puts it: "[translation] historians look at history in their own way, sociologists in theirs, and so on." In this sense, one is returning to the universe of heuristics, in which the results are influenced by "a more or less arbitrary division into compartments or scientific approaches" (Lazure, 1990). Interdisiciplinarity is a means of rectifying this problem (Lazure, 1990). In short, to find solutions to complex problems, diversity is needed both in the personal identities of the members of a group (based partly on their individual experiences) and in their academic disciplines.

### 5.5.2.3 Interpretations

Page defines an interpretation differently from the way it is usually defined in psychology. For Page, an interpretation is a process by which we use words to define objects, situations, problems and events. In other words, interpretations allow partial representations of objects, situations, problems and events. Thus we might say that interpretations are ways of categorizing reality or partitioning our perspectives.

For example, we can say that we create an interpretation of a continuous spectrum of visible light by classifying it into words, or rather, into colours (red, blue, yellow, green, etc.). We can also classify the letters of the alphabet in many different ways, but the most common one is to divide them into vowels (produced when air is allowed to pass through the mouth freely) and consonants (produced when the passage of air through the mouth is obstructed).

Page also states that interpretations let us communicate with one another more effectively. Thus, the creation of colours is the result of an interpretation of a continuous spectrum of visible light into words that let us discuss a phenomenon that almost all of us can see but that we could not discuss if we did not have a specific interpretation of it. How can we know that the colour yellow is yellow if we have not previously decided that that is what it is?

In this sense, a research team that is diverse in terms of both academic discipline and personal identity will have greater cognitive diversity, because its toolkit will contain more ways of interpreting objects, situations and events. Therefore interpretations, as presented in Page's model, result from this cognitive diversity and facilitate the solving of problems.

### 5.5.2.4 Predictive models

For Page, a predictive model describes what we think is going to happen in certain contexts, in light of our interpretations. In fact, he states that we base our predictions about the future on our interpretations of the world and our past experience. For example, we can predict that we are going to like a certain film if we know that we have liked all the films that its director has made in the past. We can apply a similar process to predicting whether we are going to enjoy a meal at a certain restaurant or receive good service at a certain store, for example. But it is important to note that two different people can have different predictive models for the same situation. To return to the example of the film, one person may predict that she is going to like the film while another may predict that she will not like it. This is possible because these two people have not had the same experiences in the past, and their interpretations are different. Likewise, in a research or teaching context, a diverse team can identify a broader range of possible cause-and-effect linkages and thereby achieve a broader range of research results.

To sum up, perspectives, heuristics, interpretations and predictive models form the toolkits that we can use to solve problems and make predictions. They are influenced by our identities but then evolve and change according to our education and experiences. In addition, a team that is diverse from the standpoints of academic discipline and personal identity will have greater cognitive diversity, which is advantageous in an academic setting, and especially in a research setting. That is why we should value diversity in teaching faculties, on research teams and in other settings at Quebec's universities.

## 5.6 Improved ability to interact

One aspect that is important for a team's performance is the social aspect, or rather, the team's ability to interact in an optimal manner. Then certain groups or certain people within these groups may improve this ability.

In an article entitled "The Role of Gender in Team Collaboration and Performance", Bear and Woolley (2011) state that the presence of women would greatly improve collaboration within a group. This assertion is based on studies in which a connection was found between the presence of women in a group and the ability of its members to interact. One reason may be that women express their greater social sensitivity through a greater ability to read non-verbal signals and thus more easily deduce what other members of the group are thinking and feeling. Another may be that women tend to take turns in conversation more than men and thus exert an equalizing effect on group discussions, so that everyone's knowledge and skills get put to better use.

Multicultural experience is another dimension discussed in the literature. According to Tadmor, Satterstrom, Jang and Polzer (2012), high levels of multicultural experience may increase the collective creativity of culturally diverse teams. The authors explain that "there is considerable evidence that as multicultural experiences accumulate, individuals become more competent in intercultural communication, develop a general willingness to learn from and work with people from other cultures, and demonstrate a greater tolerance for and belief in the value of cultural diversity."

## 5.7 Reduced risk of "group think"

Another benefit of diversity is that it reduces the risks associated with the psychosociological phenomenon known as "group think". Group think is what happens when a very tightly knit group makes bad decisions because none of its members dares to question the way they do their work (Bédard, Déziel and Lamarche, 2006). Everyone thinks the same way and rejects any attempt to question the majority opinion (Bédard, Déziel et Lamarche, 2006). Group think appears to have been associated with some major historical disasters, such as the explosion of the space shuttle Challenger in 1986 (Janis, 1991) and the botched invasion of the

Bay of Pigs in Cuba in 1961 (Bédard, Déziel and Lamarche, 2006).

In a study by Phillips, Liljenquist and Neale (2009), homogeneous and diverse groups were given the task of solving a murder mystery. The homogenous groups had more confidence in their conclusions, whether or not they had actually identified the murderer correctly. The diverse groups had less confidence in their conclusions and perceived the interactions within their groups as less effective, but they nevertheless performed better.

In another study (Sommers, 2006), groups of individuals played the role of juries in a fictitious trial. Some of these "juries" were composed solely of white people, while others were multiethnic. The members of the all-white juries tended to make more erroneous statements of fact and consider a narrower range of information and were less inclined to discuss matters related to ethnicity.

As Apfelbaum, Phillips and Richeson (2014) put it, " When people are prompted to think about social category differences, as they are in diverse groups, they are more likely to step outside their own perspective and less likely to instinctively impute their own knowledge onto others."

## 5.8 Improved performance

The literature shows that gender, ethnic and other forms of diversity lead to higher levels of performance.

In the management literature in particular, many studies show a connection between diversity among managers and organizational performance. A McKinsey & Company analysis of data for 366 companies in the United Kingdom, Canada, the United States and Latin America found a relationship between diversity of top management and boards of directors and financial performance. Companies in the top quartile for gender diversity were 15 per cent more likely to have financial returns above their respective national industry medians, while companies in the top quartile for racial and ethnic diversity were 35 per cent more likely to do so. Industries that commit to diversity have greater success. The reverse is also true: industries in the lower quartiles for diversity underperform. Note that the data for the United States show "no statistically significant correlation between gender diversity and performance until women constitute at least 22 percent of a senior executive team (Hunt, Layton and Prince, 2015)."

In another study, in the banking industry (Richard, 2000), the sample surveyed consisted of 63 banks in three U.S. states where the levels of diversity and bank profits and assets varied from one state to another. It was found that in those banks that had a growth strategy, ethnic diversity was positively correlated with performance.

In an article about the employment of people with disabilities in French companies, Jacquinot (2009) states that "[translation] Hiring people with disabilities can actually enhance companies' performance. It gives

them employees who are skilled and motivated; it improves the commitment, loyalty and engagement of their work force as a whole; and, receiving the approval of their stakeholders, it develops their businesses." This insight shows that employing people with disabilities should be seen not just as a challenge but also as an advantage.

## 5.9 Increased innovation

Some studies suggest that there is a positive correlation between diversity and innovation. In this regard, Richard Florida, an American economist and university professor, published a book in 2002 entitled The Rise of the Creative Class (Liefooghe, 2010) in which he develops the theory of the creative economy. This theory has been embraced by many scientists, politicians, municipalities and businesses. It posits that a city's innovation and economic development are the result of its cultural diversity and a climate of tolerance, which encourage the emergence of new ideas. In other words, cities that want to develop technological or other forms of innovation need to attract creative, talented individuals by encouraging a critical mass of indiviiduals from diverse cultural backgrounds. Even though this theory has become a victim of its own success, because it is subjected to many criticisms, it remains, in the field of economics, an important engine of developments and innovations.

### 5.9.1 Diversity as an engine of innovation

Diversity can be regarded as an engine of innovation when the presence of a group positively encourages research priorities in academia or in business. Many studies have shown that including diverse groups in the creative process provides a greater variety of perspectives and does more to meet the needs of the population as a whole. We will now try to demonstrate this proposition with a variety of examples.

1. In a study in Spain, 4277 businesses were surveyed on the subject of innovation. An analysis of the resulting data showed that the research and development teams that were more gender-diverse produced more radical innovations than the other teams (Díaz-García, González-Moreno and Sáez-Martínez, 2013).

2. Another study in Spain, covering over 12,000 businesses, showed a positive effect on innovation by research and development teams when they displayed three types of diversity: diversity in gender, education and skills (Martinez, Zouaghi et Marco, 2017). However, the effect of each of these types of diversity seems to depend on the kind of business (manufacturing versus service) and the kind of innovation (incremental versus radical). This finding was obtained through a data analysis using the Technological Innovation Panel, a statistical tool by which the innovation activities of Spanish businesses can be examined over time.

3. Monique Frize reports an example that occurred in New Brunswick in the 1980s (Frize, 2010). A female civil engineer on a team that

was designing a ferry terminal placed changing tables in the men's and women's washrooms, on the basis of her experience as a mother. Today, this practice has become generalized. Changing tables are provided in shopping centres. airports, restaurants and other public facilities.

4. Women are responsible for 50% of vehicle purchases and influence 80% of vehicle purchasing decisions (Richard, 2000). Including women on design teams lets vehicle manufacturers meet women's needs more effectively. At General Motors Canada, many safety characteristics adapted specifically to women's needs—such as night vision, emergency satellite location, child safety locks, and seat adjustments for pregnant women—were introduced by a female design team.

5. It has been found that when there is no diversity in the design process, the products, processes and services designed tend to do a poorer job of meeting the public's needs, and errors may even be made. Google's experience provides a good illustration of this finding (KPCB, 2016). Google developed a software function for easily uploading videos to YouTube from smart phones. But oddly enough, 10% of the videos uploaded appeared to be upside down. It turned out that everyone on the development team was right-handed, and no one had considered how holding a phone in one's left hand would affect the shooting of videos. Luckily, this error had no serious consequences.

6. In other cases, however, the repercussions of intentionally or unintentionally ignoring the differences among different groups in society can be more serious. For example, several years ago, 8 out of 10 prescription medications were taken off the U.S. market because they had turned out to pose greater health risks for women than for men (Simon, 2005). The reason was that in developing these medications, a 70-kg white male had been used as the reference standard, even though more and more was becoming known about the differences between men and women.

7. Un autre exemple concerne les mannequins de simulation d'impact qui, jusqu'en 2011 aux États-Unis, représentaient un homme de taille moyenne (Shaver, 2012). Lors d'essais d'impact avec une Sienna 2011, le mannequin féminin a enregistré un risque de 20 % à 40 % d'être tué ou sérieusement blessé, comparativement à 15 % pour le mannequin masculin. Enfin, notons les premiers stimulateurs cardiaques qui ont été développés pour une poitrine d'homme et qui étaient trop grands pour les femmes (UNESCO, 2007).

All of these examples show that a group's absence or presence influences research and development priorities (UNESCO, 2007).

### 5.9.2 Innovation as an engine of diversity

To further demonstrate how innovation is an engine for diversity, we will now present some findings about education systems. The first set of findings comes from a report on inclusive education and educational success for Indigenous people in Quebec. This report, submitted to Quebec's Conseil supérieur de l'éducation (CSE), states that above and beyond any social, economic or political variables, Quebec's educational system is not always appropriate to the educational needs of Indigenous students and must therefore be adapted to their needs in various ways (Campeau, 2019). Citing statistics for Canada as a whole, this same report states that as of 2011, 58% of Aboriginal young adults age 20 to 24 had not completed secondary school, compared with 41% for the non-Indigenous population" (Campeau, 2019).

To further investigate the impact of such cultural differences, the CSE conducted a study in two Quebec public primary schools where over 50% of the students were Indigenous. According to Campeau (2019), this study's findings raise questions about certain aspects of Quebec's school curriculum that should better represent the realities and particularities of Indigenous people. Consequently, Campeau proposes an Indigenous pedagogy that adopts a hybrid approach to incorporate dimensions of Indigenous culture into primary education in Quebec. More specifically, the hybrid approach that Campeau proposes would combine methods associated with Indigenous culture and methods already used by teachers in the primary schools. This hybrid approach is practical and represents an innovation for Quebec's education system, for the purpose of incorporating diversity into Quebec's schools. This approach obviously entails its share of challenges, but on balance would have a positive impact on all students in Quebec.

Along the same lines, the Aboriginal Student Retention Fund, in partnership with the Centre de transfert pour la réussite éducative du Québec (CTREQ) and the government of Quebec, has funded 22 Francophone and Anglophone projects in Indigenous communities in Quebec to encourage youth age 19 and younger to stay in school (CTREQ, 2013). At the CTREQ's request, Natasha Blanchet-Cohen, a professor and researcher at Concordia University, assessed the impact of these 22 projects and found that they did in fact increase school retention of Indigenous youth (PSJA, 2019).

As of this writing, the Aboriginal Student Retention Fund is no longer funding these projects, but most of them are continuing anyway. As the Fund's website puts it, this "highly positive collaboration reflects aboriginal communities' ability to mobilize their resources, take action, and implement sustainable student retention solutions" (PSJA, 2019). Thus this collaboration is innovative and may motivate Indigenous youth to attend university, thus encouraging diversity in that setting too.

## 5.10 Summary table

The following table summarizes the many positive effects that diversity can have in the university setting.

| | | |
|---|---|---|
| 1. Presence of role models | 4. Greater development of students' skills | 7. Reduced risk of "group think" |
| 2. Wider range of concerns | 5. Improved ability to solve problems and make predictions | 8. Improved performance |
| 3. More diverse student body | 6. Improved ability to interact | 9. Increased innovation |

# 6. Potential challenges of diversity

Despite all of its potential benefits, diversity can also entail challenges that must not be overlooked.

## 6.1 Personal problems

Within institutions, members of minorities may experience personal problems such as exclusion, isolation, discrimination and harassment (Turner, González and Wood, 2008; The National Academies of Sciences, Engineering, Medicine, 2007; Hurtado, Carter and Kardia, 1998).

Social psychology research has shown that the phenomenon of categorization influences intercultural relations (PSJA, 2019). Although this is a normal phenomenon in which the individuals in a group tend to "flock together" (what is known as the similarity-attraction effect), it can also have effects such as isolating one group from another.

In an article on practices and perceptions regarding disabilities in the workplace, researchers from the Université de Moncton and the Université du Québec à Rimouski describe two surveys conducted to examine the experience of people with disabilities in the labour market (Torchia, Calabrò and Huse, 2011). In general, the results showed that people with disabilities are victims of discrimination in the labour market and are subject to greater stigmatization. The respondents also perceived their social relationships in the workplace as very difficult and even described their interactions with their colleagues and employers as tense.

## 6.2 Communication problems

Groups whose members have diverse identities may experience communication problems. For example, Chen and Duh (2010) observed dynamics of exclusion and dominance within ethnically diverse design teams. Communication problems can also arise because of intercultural misunderstandings, which inevitably increase the time devoted to resolving conflicts (Jacobi and Schweers, 2017). Lastly, many studies have shown a connection between the genders of the people talking and the frequency of interruptions (Jacobi and Schweers, 2017). For example, a recent study showed that women who appear before the Supreme Court are interrupted at a disproportionate rate compared with men during the proceedings (KPCB, 2016). In fact, male judges and lawyers interrupt their female colleagues more often than they do their male colleagues.

## 6.3 Problems associated with fundamental and instrumental preferences

According to Scott E. Page, we all have fundamental and instrumental preferences, which can be obstacles in some contexts (Page, 2007). As he explains, the members of a diverse team do not necessarily have different preferences, but they often do, and when they do, it can cause problems and challenges—for example, if these preferences conflict with deeply held values.

### 6.3.1 Fundamental preferences

Fundamental preferences are in a sense our most profound goals, our destinations. Do we want to go to Montreal, to Quebec City or to Trois-Rivières? In fact, people who have different fundamental preferences have different values. Promoting diversity in our institutions is a good thing, because it offers many potential benefits, but the individuals concerned must have the same fundamental preferences. Otherwise, there is a risk that problems will develop among these individuals. Thus, a group that is diverse from the standpoint of identity will work better if the individuals share the same fundamental preferences—in other words, if they are all headed for the same destination.

For example, when a team of people are working together at a university or other workplace, it is important that these team members share the same fundamental preferences regarding the basis of their work, even if their identities are diverse. Their fundamental goals regarding the task at hand must be the same. Otherwise, there may be discord among them, and that may even cause the project to be aborted. All of the members of the team must be looking in the same direction.

### 6.3.2 Instrumental preferences

Instrumental preferences can be described as the means you use to get to your destination. You want to go to Montreal, but do you prefer to go by car, bus, or train? People who have different instrumental preferences but the same fundamental preferences have the same values. But they have different beliefs about how the world works.

In a group, if the individuals have different instrumental preferences, it is easier to manage problems, because they all have the same values and the same destination in mind. But managing problems or conflicts can become a challenge if one member of the group sticks to his or her position and will not agree to any compromise.

### 6.4 Need for a critical mass

As Torchia, Calabrò and Huse (2011) explain, for individuals who are in a minority in a group to have an impact on that group, a critical mass must be attained. These authors analyzed the influence of the presence of women on the boards of directors of 317 Norwegian companies. These boards had 6 to 12 members each. The authors observed that there had to be at least three women on a board for them to interact and influence the board's working style, processes and tasks and consequently have a positive influence on the organization's level of innovation. Having three women appeared to facilitate interactions between the majority and the minority, thus enabling the board to make better decisions.

A critical mass is also needed for there to be enough role models. As Iris Bohnet explains, the presence of only a small number of female role models may send the message that it is hard for women to reach decision-making positions within the organization, that there is a competition between the genders, and that these positions are already taken (Bohnet, 2016). Bohnet also adds that this can lead to discrimination among women.

## 6.5 Summary table

The following table summarizes the challenges and negative effects that can sometimes arise from diversity in academic and other environments.

| | |
|---|---|
| 1. Personal problems | 3. Problems associated with fundamental and instrumental preferences |
| 2. Communication problems | 4. Need for a critical mass |

# 7. Benefiting from diversity

In conclusion, we cannot measure equity, diversity and inclusion by statistics alone (for example, the percentage of female professors in engineering faculties). We must also look at issues such as the work climate, well-being, cultural safety, contribution and progress. Diversity can have many positive effects on the academic community but can also entail some significant challenges. Hence, to benefit from diversity, it is essential to use some "levers" associated with it, such as education, development and implementation of policies and creation of more inclusive environments. In support of this observation, a report on the participation of Aboriginal people in the economy, submitted by a working group to Canada's federal, provincial and territorial ministers responsible for Aboriginal affairs and national Aboriginal leaders states that "[translation] the participation of Aboriginal people in the economy is a concept of inclusion by virtue of which the communities and their members contribute to the economic growth and prosperity of all regions of Canada and derive more benefit from it" (Gouvernement du Québec, 2001). This same report states that "[translation] the benefits expected from greater participation in the economy are wide-ranging. They include jobs, the creation of wealth for individuals and businesses, opportunities for professional development for workers, the establishment of economic infrastructure in the communities, benefits for businesses and entrepreneurs and additional revenues for the communities" (Gouvernement du Québec, 2001). Thus we can see that the benefits of diversity accrue not only to the designated groups but also to society in general. Everyone concerned can benefit from diversity!

Make a commitment to promote equity, diversity and inclusion in your institution!

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# Appendix

Table 1: Representation of designated groups in the populations of Canada and Quebec

| | Designated Groups | | | | Intersectionality of women with other designated groups | | |
|---|---|---|---|---|---|---|---|
| | Women | Indigenous People | People with Disabilitiess | Members of Visible Minorities | Indigenous Women | Women w/ disabilities | Women from visible minorities |
| **Canada** | | | | | | | |
| Population | 51% | 4% | 14%* | 21% | 2,3% | 8%** | 11% |
| Bach. or + | 51% | 2% | 8%* | 31% | 1,0% | - | 16% |
| **Quebec** | | | | | | | |
| Population | 54% | 2,2% | 10%* | 10%* | 1,1% | - | 5%* |
| Bach. or + | 55% | 1,0% | - | 16%* | 0,7% | - | 8%* |

*Data from the 2016 Census (Statistics Canada)*
** Canadian Survey on Disability, 2012*
*** Estimate based on the 2016 Census and the Canadian Survey on Disability, 2012*

**Table 2:** Percentage of women applying to grant competitions of the three federal funding agencies

| Federal funding agency | NSERC | CIHR | SSHRC |
|---|---|---|---|
| Percentage of women among grant applicants | 21% | 35% | 45% |

*The data come from the following competitions: NSERC Discovery Grants (2011-2012, 2012-2013 and 2013-2014), CIHR Open Operating Grants (2011-2012, 2012-2013 and 2013-2014) and SSHRC Insight Grants (2011-2012, 2012-2013 and 2013-2014)*

**Table 3:** Availability pool used for each target

| Availiable indicator (based on self-identification) | Designated Group | Target |
|---|---|---|
| Proportion of university teachers who identify as Indigenous* | Indigenous people | 1% |
| Percentage of doctorate holders with disabilities ** | People with disabilities | 4% |
| Percentage of university professors who may be designated as belonging to a visible minority* | Members of visible minorities | 15% |

** Source: Canadian Association of University Teachers, CAUT Almanac of Post-Secondary Education in Canada 2013-2014, Table 2.20. Visible Minority, Aboriginal and Other Background of University Teachers, 2006; Statistics Canada, 2014, semi-custom tabulation (contact CAUT).*
***Source: Human Resources and Skills Development Canada, 2006, Employment Equity Data Report, Table 8 Population Showing Representation by Highest Degree, Certificate or Diploma for Women, Aboriginal Peoples, Visible Minorities, and Persons with Disabilities. Ottawa, 2006.*