Identifying Microaggressions towards Equity-Deserving Groups in Engineering across Higher Education in Ontario

A Snapshot of Experiences Shared
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Abstract

Acknowledging that discrimination and prejudice of various sorts (e.g., verbal, behavioural, environmental) continue to exist in the education system, this research seeks to address how and why microaggressions against Black, Indigenous, and Persons of Colour (BIPOC), within engineering departments, show up across interactions between students and professors, among peers in classrooms, and across interactions in lab environments and other group activities or projects. This research aims to shed light on the prevalence of these microaggressions as they appear in not only in-person learning, but additionally, on how they might have become embedded within virtual learning environments. With a focus on the engineering community, this research includes findings based on experiences shared by persons identifying as Black and/or of colour. While efforts were made to gather many voices, Indigenous representation is lacking in this research. The research was conducted in fully virtual settings with students and recent graduates across higher education institutions (HEIs) in Ontario, who were contacted through the Ontario Society of Professional Engineers' (OSPE) member network of engineering students. The findings from this study revealed that there are several instances of repeated microaggressions showing up towards specific equity-deserving groups, including those that identify as Black, East Asian, and/or women.

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Chapter 1. Introduction

1.1 Overview

While the ill effects of bullying are taught in grade schools across Canada, the disturbing reality is that another form of bullying - microaggression, is prevalent far into adulthood. The prevalence of microaggressions has been left out of the conversation for too long. Microaggressions can be apparent in various forms and are defined (Sue et al. 2007) as subtle behaviours or statements that denigrate people because of differences or biases on socioeconomic status, disability, gender expression or identity, sexual orientation, race, ethnicity, nationality, or religion. While we understand that “name-calling is bad” and “keeping to yourself if you have nothing nice to say” are concepts ingrained in our minds when we are taught about bullying, there is a lack of public awareness on how bullying also includes microaggressions. Some identified forms of microaggressions in universities and colleges include the following (Portman, 2013):

- Failing to learn to pronounce or continuing to mispronounce the names of students, peers, lecturers, teaching assistants (TA), and others after you have been corrected by them
- Scheduling group meetings on religious or cultural holidays; disregarding religious traditions or their details. (e.g., impacts of fasting)
- Setting low expectations for peers from particular groups or neighbourhoods
- Calling on, engaging, and validating one gender, class, or race of students while ignoring others during class
- Assigning peers tasks or roles that reinforce particular gender roles or not allowing flexibility across roles and responses
- Anticipating peers’ emotional responses based on gender, sexual orientation, race, or ethnicity
- Using inappropriate humour in class and in the lab that degrades peers from different groups
- Expressing racially charged political opinions in class assuming that the targets of those opinions do not exist in that class

To understand the prevalence of microaggressions, including the ones mentioned above, it is important to consider our understanding of conscious and unconscious biases as well, which are briefly discussed later in this report. This research focuses on identifying microaggressions towards Black, Indigenous, and Persons of Colour (BIPOC) in engineering across higher education in Ontario. While efforts were made to include many voices from different backgrounds, this research did not effectively capture Indigenous representation. Failing to capture Indigenous voices could quite possibly indicate that there is an even greater need to develop outreach programs, focusing on raising the representation of Indigenous students in engineering across

Ontario. The term BIPOC will hereon not be used in this study. Instead, equity-deserving groups will be the term used to include those identifying as Black and/or persons of colour.

Ryerson University recently conducted a survey across their entire student population and released its first-ever Student Diversity Self-ID Report. The report provides representation data for students from five equity groups: women, racialized people, [Indigenous] peoples, persons with disabilities, and 2SLGBTQ+ people, as well as the three largest racialized groups at Ryerson and the Greater Toronto Area: Black, Chinese, and South Asian (Ryerson, 2021). The report reveals that Indigenous students and students with disabilities are substantially underrepresented in both undergraduate and graduate programs compared with representation in the community (Ryerson, 2021). Moreover, there is a *significantly* lower representation of racialized, especially Black persons, in graduate studies compared to their representation in undergraduate programs (Ryerson, 2021).

1.2 Purpose, Scope, and Objective

With thousands of engineering students across Ontario in undergraduate and graduate programs each year, there is a vital need to ensure that the culture fostered in post-secondary education is one which does not tolerate microaggressions. Currently, there is a large knowledge gap between the prevalence of microaggressions towards equity-deserving groups in the engineering community and the negative implications of those microaggressions. This research addresses how equity-deserving groups in the engineering community in post-secondary institutions have experienced forms of microaggression and how those negative experiences affect students' performance in school and deflect their career development within engineering. This research may be used as a steppingstone to deepen the understanding of microaggressions towards other equity-deserving groups. The goal is to use the findings from this qualitative research to continue efforts, in an amplified way, towards fostering an equitable, diverse, and inclusive environment in higher education that does not tolerate microaggressions, especially with the engineering community in Ontario.

The primary objective of this study was to assess and demonstrate the frequency of microaggressions towards BIPOC in engineering across higher education in Ontario, through anecdotal evidence gathered from interviews and focus groups.

1.3 Literature and Conceptual Framing

Unconscious biases can include social stereotypes about certain groups of people that individuals form outside of their own conscious awareness (University of California, n.d.). These biases lead us to knowingly and most often, unknowingly, contribute to the rise in microaggressions in post-secondary education. Equity-deserving groups are historically disadvantaged groups based on a number of factors, including, but not limited to, race, ethnicity, and gender. Institutions, industries, corporations, government bodies, and more, have now increasingly been focusing their efforts to include and highlight Equity, Diversity, and Inclusion (EDI) in their mandates. While they showcase their leadership in this emerging topic of discussion,

it can sometimes appear pretentious and performative when we see equity-deserving groups continue to experience acts of microaggressions in higher education and through internships or other job opportunities. In addition, recent events, such as the Black Lives Matter (BLM) protests following the brutal killing of George Floyd by four police officers in the United States (U.S.), have shone a spotlight on the long-standing racial injustice and discrimination faced by people who are Black, not just in the U.S. but in many other parts of the world (Scott, 2020). The knowledge gap between microaggressions in schools and in the workforce, experienced or witnessed by equity-deserving groups, remains largely unexplored.

Prior studies have found that racial microaggressions alienate students of colour from their learning environments, causing physiological and psychological stress and worsening their academic experiences (Cardoza, Galic, and Thorsen, 2017). Further, a study from 2017, conducted at St. Olaf College in Minnesota, U.S., found that 65.4% of students who observe and students who are targeted by racialized microaggressions report negative academic impacts (Cardoza, Galic, and Thorsen, 2017). The study also found that microaggressions negatively impact relationships with classmates and professors for students of colour, who scored, on average, 14.6% lower than white students on a 15-point index (Cardoza, Galic, and Thorsen, 2017). This report emphasizes that there is a lack of understanding in research on whether or not students who have observed microaggressions are as negatively affected as those who are targeted. While a handful of self-identity surveys and questionnaires have been administered across Ontario's post-secondary institutions, it remains a challenge to accurately determine the number of enrolled engineering students that self-identity as equity-deserving members of their respective communities. Collecting this data is crucial in understanding what percentage of students have experienced or witnessed forms of microaggression during their time in school.

OSPE recently conducted a study on Breaking Barriers for Women in Science, Technology, Engineering, and Math (STEM)- indicating that the underrepresentation of particular equity-deserving groups, like women, in the engineering field, begins in schools and continues throughout their education. Some of the key observations made were that women identify different challenges to advancement, indicating that different marginalized groups face different barriers when studying in engineering and moving into the workforce. A recommendation that comes from OSPE's study is that instead of setting quotas for meeting diversity and inclusion in schools and in the workplace, it is time for cultural and workplace policy changes to eliminate any and all forms of discrimination and inequity (Ontario Society of Professional Engineers, 2020), including microaggressions.

1.3.1 Prejudice towards Marginalized Communities in the Engineering Industry

Prior to discussing prejudice commonly faced by members of equity-deserving communities, it is important to understand what constitutes a marginalized community in the context of this research. Marginalized populations, as previously mentioned, are groups and communities that experience various degrees and forms of oppression and discrimination against them. Discriminatory acts of any sort towards marginalized communities can enable feelings of exclusion and alienation from the larger student body in higher education. While multiple factors

can be taken into consideration to better understand where discriminatory behaviour stems, this review is focused on understanding the extent to which these acts impact education/learning success for marginalized communities within the engineering field.

Some examples of marginalized populations have been shared earlier. The following are examples of some marginalized groups:

- 2SLGBTQ+ (The acronym "2SLGBTQ+" stands for Two-Spirit, lesbian, gay, bisexual, transgender, queer (or questioning). The plus sign represents other sexual identities, such as pansexual or asexual) (Canadian Virtual Hospice, 2021)
- Racialized persons, including Black and Persons of Colour
- Indigenous community members
- Women
- Refugees and newcomers to Canada

The papers reviewed for this research are based on studies conducted in the United States. Few studies on this topic have been conducted with regards to Canadian higher education institutions. A recent study, If you aren't White, Asian or Indian, you aren't an engineer": racial microaggressions in STEM education (Lee, Collins, Harwood, Mendenhall, and Huntt, 2020), drew results from an online survey of 4,800 students of colour attending a large public university in the U.S. and the STEM major subsample was composed of 1,688 students of colour. The results from that study evidently showed that *racial* microaggressions are not isolated incidents but are ingrained in the campus culture, including interactions with STEM instructors and advisors, and with peers. The *sociohistorical context*, such as the history of injustice within a society, social awareness of individuals and groups within a society, and social justice efforts at national and community levels, shapes the campus racial climate as well (Lee et al., 2020). The study cites the following, in regards to prejudice towards specific marginalized groups in engineering:

> For Asian American students, representation in STEM is explained by such stereotypes as superior intelligence, strong work ethic, or excelling in math, all of which are a part of the model minority concept (McGee et al., 2017; Trytten et al., 2013). For Black and [Hispanic] students, their underrepresentation is falsely attributed to personal characteristics such as inferior intelligence, weak work ethic, and deficiencies in mathematics (Long III & Mejia, 2016; Ma & Liu, 2015; Oakes, 1990).

Some of these stereotypes have blatantly become embedded in conversations and discussions that take place between peers and students with faculty members, and vice versa. Unfortunately, these occurrences continue to happen and efforts to counteract these instances are minor in impact. These common examples of prejudice towards marginalized groups in engineering across universities and colleges typically go unnoticed until we hear of those experiencing them taking a stand. Unfortunately, the onus seems to always be on those affected to raise awareness and advocate for change.

1.3.2 Higher Education Institutions (HEIs) and the Role they Play in Fostering Inclusive Environments

HEIs play an integral part in fostering inclusive environments on and off campus. Traditionally, policies and frameworks governing different faculties, including engineering and architectural science, were developed and managed through a centralized system. In these centralized systems, it would often be the responsibility of the governing body of the institution to ensure that policies were robust and fit to their needs. A review on the roles that HEIs play here has shown that in recent years, the process of developing, refining, and implementing new policies and frameworks has become decentralized. Decentralizing this process has served a number of benefits, including the opportunity for more students and faculty to share their voices in advocating for positive social change on campus, and for policies to be developed much more effectively and efficiently.

After the Minneapolis, Minnesota, U.S. killing of George Floyd (Forliti, Karnowski, and Webber, 2021), students of all walks of life have stood in solidarity with the Black Lives Matter social movement and called on their schools to take action in a multitude of ways. One of those ways includes creating environments within higher education that support and appreciate the diversity and inclusivity of the student body. After the thousands of protests that took place worldwide to demonstrate the severity of systemic racism embedded within our social circles across North America, universities and colleges in Ontario, Canada have begun to implement a number of fellowships and programs specifically for Black students, as a starting point (Government of Ontario, 2021). It is tragic that these are the types of events and situations it has historically taken for governing bodies at HEIs to take action.

Some examples of the fellowships and programs that have stemmed from calls to action after the protests include the following:

- National Dimensions Pilot Program (2020)
- Black Innovation Program at the DMZ (Ryerson) (2020)
- Black Innovation Fellowship Bootcamp- *Ryerson University* (2020)
- Black Graduate Student Awards- *Ryerson University* (2020)
- Indigenous and Black Engineering and Technology (IBET) Momentum Fellowships (2021)- *McMaster University, University of Waterloo, University of Ottawa, University of Toronto, Queen's University, and Western University*

Unfortunately, with the COVID-19 pandemic forcing the student body to transition to virtual learning, it remains in question how these initiatives will affect the social dynamics of in-person interactions across campuses. Although there has been a nationwide call for more diversity in the STEM fields for the past two decades, the results of these efforts have been slow and, in some cases, insignificant (Lee et al., 2020). According to a 2019 report by the U.S. National Science Foundation that examined graduating college students at 4-year institutions from 1996 to 2016, diversity efforts have been mixed for students of colour graduating with engineering degrees (Lee et al., 2020). Over almost two decades, Hispanic graduates have grown from 5.9 to 10.4% of

graduates in this field. However, the proportion of Black students has decreased over this period from 4.7 to 3.86% (Hamrick, 2019).

1.3.3 Biases Embedded within Institutional Policies

Regarding existing institutional policies, it is common to see institutionalized discrimination which may have been overlooked until recent years. Institutionalized discrimination refers to discrimination embedded within procedures, policies, and other documentation that institutions, such as universities and colleges, adhere to. Generally, institutional bias affects historically marginalized groups. Traditionally, institutional policies had been written by founding members and those committee members which were closely selected by the founding member(s). The danger in having these policies written by only a handful of individuals is that no opportunity for public consultation existed. As a result, those who were not actively involved in the formation of certain procedures, policies, frameworks, and guidelines, could expect to be inaccurately portrayed and described in text. Taking Ryerson University as an example, the founding member- Egerton Ryerson - has come under heavy scrutiny over the last few years, and especially in recent months, as light has been shed on his past involvement in helping to establish and supporting residential schools, designed to assimilate Indigenous students into Western culture. Indeed, in August 2021, the Ryerson Board of Governors approved a motion to accept recommendations, including the recommendation to rename the university, presented by the Standing Strong (Mash Koh Wee Kah Pooh Win) Task Force (Lachemi, 2021).

Despite progress over the years in mitigating discriminatory practices, many higher education institutions across Canada continue to target or exclude hundreds of thousands of students each year on account of several factors, including age, sex, gender, ethnicity, disability, religion, among others. The Intercultural Development Research Association (2018) shares that several practices of institutionalized discrimination impact education and career advancement every day. From faculty hiring to drawing school boundaries, regional and provincial practices harm underrepresented students and communities (Hinojosa, 2018). Some of the examples of biases embedded in institutional policies in the education system, as stated by Hinojosa (2018), include the following:

- Institutionalized discrimination of low expectations
- Funding inequities
- Standard, narrow curriculum

A recent study of school funding showed that districts with the highest enrollment of Hispanic, Black, or Native American (Indigenous) students (in the U.S.) received, on average, about $1,800 less per student than the districts enrolling the fewest students of colour (Morgan & Amerikaner, 2018). While it is unclear in this study whether it was grade schools or higher education being studied, it can be drawn that the inequities in financial models continue to affect students at various levels in their education, since a good amount of funding is received from governing bodies. Other examples of biases embedded in the higher education policies and other formalized documents include literature that fails to include a multitude of diverse perspectives,

examinations of religious conflicts solely from a Christian perspective, and historical lessons that fail to account for female experiences or perspectives (Hinojosa, 2018).

The achievement gap in education is another example of institutionalized discrimination. The achievement gap refers to the observed disparity in educational measures between the performance of groups of students, especially groups defined by gender, race/ethnicity and socioeconomic status (Institutional Prejudice or Discrimination, 2016). This disparity includes standardized test scores, grade point average, dropout rates, and college enrollment and/or completion rates (Institutional Prejudice or Discrimination, 2016).

1.4 Research Questions

This primary questions to answer in the research project were:

- Do most equity-deserving students experience microaggressions at some point in their schooling?
- How might these experiences have hindered academic performance and/or opportunities to participate in activities relating to educational attainment and extracurriculars of equity-deserving students in engineering?
- How might microaggressions be transferred between learning environments when the COVID-19 pandemic forced in-person learning to become virtual learning?

A comprehensive list of questions asked during the interviews and focus groups is shared in the next section of this report. These questions were compiled and reviewed by the larger research team consisting of two academic supervisors from Ryerson University, Nika Zolfaghari and Dr. Medhat Shehata, and the industry supervisor from OSPE, Dr. Lee Weissling.

Chapter 2. Methods

2.1 Participant Recruitment

Participants were recruited using a Google Form, distributed to OSPE's member network of students and recent graduates (alumni) through a "*Call for Participants"* email, with a reach of over 1,500 members. The questions asked in the Google Form are shared in Table 1. The same email was shared with the Engineering Student Societies' Council of Ontario (ESSCO), which represents engineering societies from 16 universities across Ontario, and acts as the link between engineering students and professional associations, academia, and government (ESSCO, 2021).

Table 1- Questions from Google Form

	Question	**Options**
1	Please indicate the gender identity that you most identify with.	Man, Woman, Non-Binary, Prefer not to answer (please use the "Other" option below to specify)
2	Do you self-identify as Black, Indigenous, or a Person of Colour?	Yes, No, Prefer not to answer
3	Do you self-identify as an individual with an Indigenous background?	Yes, No, Prefer not to answer
4	Are you a student enrolled in an accredited engineering program at a post-secondary institution in Ontario? (Please note you must be a current student or recent graduate to participate in this study. A recent graduate is someone who graduated in 2018 or later).	Yes, No, Prefer not to answer
5	Please indicate your student status or recent graduate status below. (Please note that a recent graduate here is someone who graduated in 2018 or later).	Undergraduate, Graduate, Post-Doctoral Fellow, Recent Graduate, Prefer not to answer
6	Which post-secondary institution do you or have you attended for engineering? Please list all where you studied engineering or relevant fields.	*Open-ended question*

From the responses collected, participants were interviewed or selected for focus group discussions on a rolling basis, prioritizing self-identified equity-deserving people first. Moreover, participants were selected based on a qualitative assessment of the attributes listed in Table 2.

Those who had one or more attributes in the “High” priority column were selected immediately for an interview or focus group discussion (based on what they indicated they were interested in). Those who had one or more attributes in the “Moderate” column were selected secondary to those in the first instance, ranking with one or more attributes in the “High” column.

Table 2-Qualitative Assessment of Participants

	Low	Moderate	High
Background (1)		Non-equity-deserving	Equity-deserving
Background (2)		Persons of Colour	Black, Indigenous
Gender		Men	Women, Non-Binary
Student Status		Recent Graduate	Undergraduate, Graduate

2.2 Data Collection

2.2.1 Setting and Institutional Climate

Participants that took part in the research were students or recent graduates of accredited engineering programs in universities across Ontario. A formal Ryerson Ethics Board application was approved and is documented in Appendix A.

There are 15 institutions across Ontario that are members of ESSCO and part of OSPE’s network. A list of these institutions can be found in the Appendix B. Most of these institutions are spread across urban regions of Ontario. A review of student clubs and organizations on campuses indicates that more than half of the member institutions have a strong presence of equity-deserving groups. Whether or not those students identifying as belonging to equity-deserving groups are enrolled in engineering programs remains in question as self-identifying surveys for reporting purposes have only recently become common.

2.2.2 Interviews

The 1-on-1 interviews, approximately 20-30 minutes in duration, were semi-structured. This format allowed the interviewer to pivot the conversation based on the interviewee’s direct responses and experiences shared. They were all conducted via Zoom between the lead researcher and the participant. Interviews were recorded and transcribed so that trends and observations could be drawn later. Questions asked during the interview are listed in Table 3.

Table 3- Questions asked during Interviews

	Question
1	Are you familiar with microaggressions and the various ways in which they can occur in higher education?
2	Have you ever been a victim of or witnessed (or heard of) any acts of microaggression in the engineering community or department? If the answer is yes, are you willing to share your experience dealing with microaggressions in higher education? If the answer is no, what acts of microaggression in the engineering community within higher education may likely arise?
3	Do you find that BIPOC have been targeted in subtle, mundane, and derogatory acts of microaggression during your time pursuing higher education?
4	How do you feel when you reflect on microaggressions that take place within the engineering community within higher education, especially when these acts might be targeted towards the BIPOC community?
5	In the transition from in-person to virtual learning environments, have you noticed any subtle changes construed as microaggressions, in the behaviour of students when it comes to interacting in group projects and assignments?
6	Have you ever hesitated to take on new opportunities because of microaggressions that you may have experienced, witnessed, and/or overheard?

2.2.3 Focus Groups

The focus groups were hosted virtually through Zoom. Participants were told they could use pseudonyms to keep their identities confidential but were asked to include their pronouns in their screen name. The focus groups lasted 60 minutes and included a short introduction on the topic of microaggressions, with examples shared, and an opportunity to participate in breakout sessions while working together with other participants on a Google Doc. The Google Doc was used to collect responses from participants and included the questions listed in Table 4. Note, to encourage participants to share their thoughts and comments freely, focus groups were *not* recorded. Instead, an academic supervisor was present with the lead researcher to capture and document important comments shared and addressed during the open discussion.

Table 4- Questions asked during Focus Groups

	Question
1	What acts of microaggressions do you believe students face?
2	Do you or have you face(d) these challenges? In what ways? Do you feel that these challenges are/were related to a specific identity? If you are comfortable sharing, please share what identity/identities these microaggressions were directed towards?
3	How do you think that microaggressions negatively affect a student's experience in their courses, group projects, or other activities related to their studies?
4	What instances of microaggressions have you, or might you, notice in virtual learning environments?
5	Have you, or someone that you know, ever hesitated to take on new opportunities because of microaggressions that you may have experienced, witnessed, and/or overheard?
6	What do you believe is the value in having conversations on microaggressions within the engineering community in higher education?

Chapter 3. Research Findings

3.1 Sample Demographics

Through the responses gathered from the call for participants, 17 participants were selected to complete an interview. Similarly, a total of 14 participants attended focus group discussions. The sample demographics for the interviews and focus groups are shown separately and can be found in Appendix C. The demographics are broken down based on gender, self-identification of being equity-deserving, student status, and institution that the participant attended or is currently attending. Note, *all* focus group participants self-identified as equity-deserving BIPOC.

While 17 participants attended interviews and 13 attended focus group discussions, it should be noted that *some* of those that completed the interviews also completed the focus groups. There were a total of 19 participants that participated in this research. A compilation of both interview and focus group samples presents the following breakdown, in Figures 1-3.

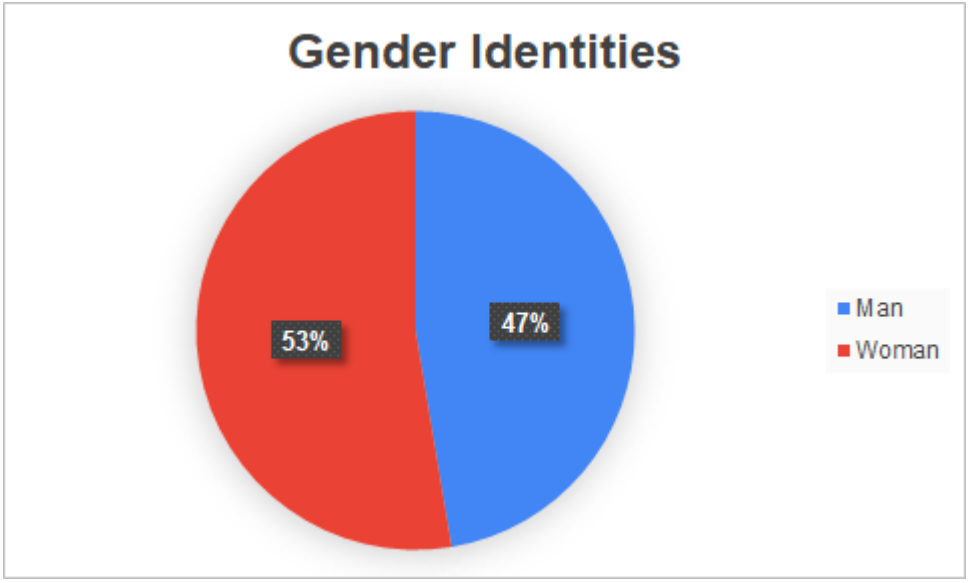

Figure 1- Interview and focus group sample by gender

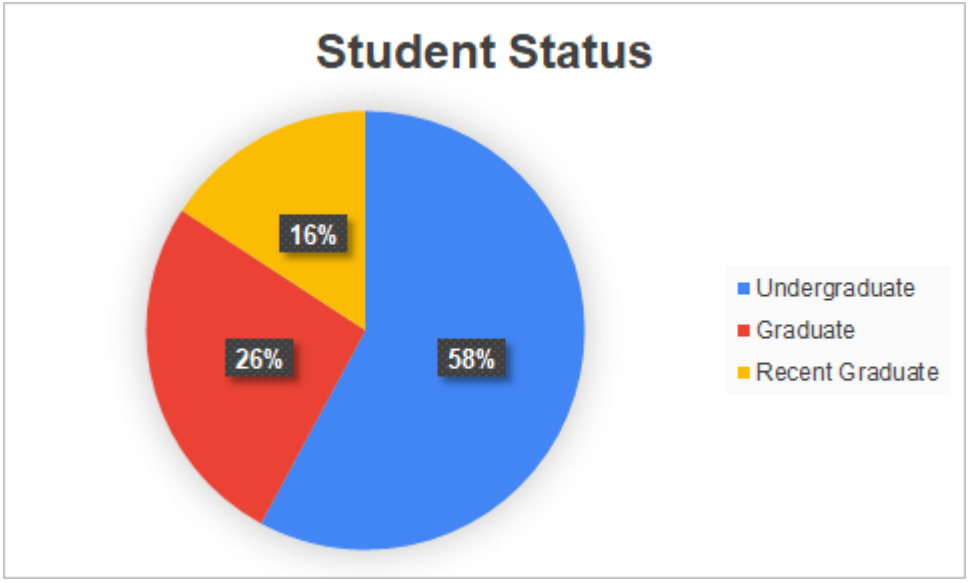

Figure 2- Interview and focus group sample by student role

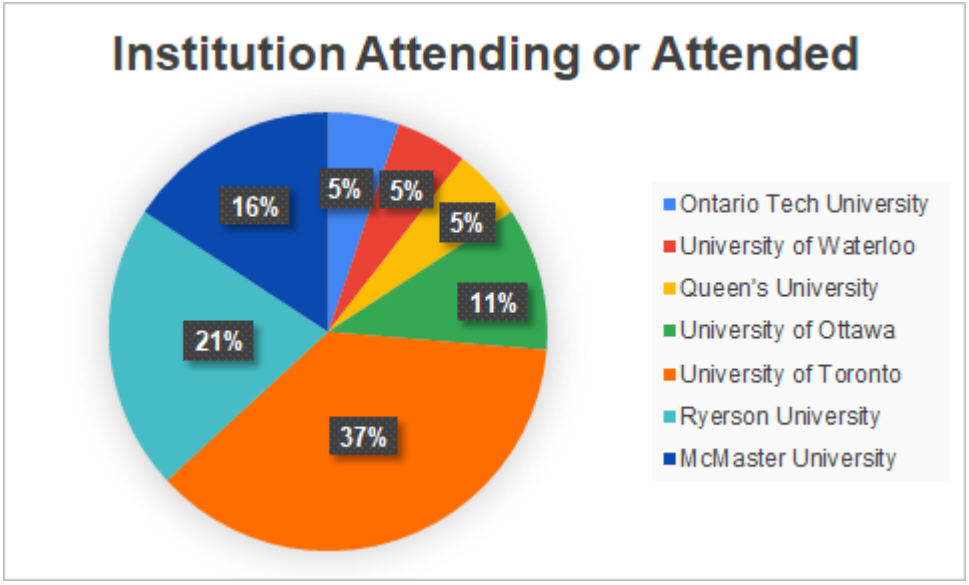

Figure 3- Interview and focus group sample by institution

The compilation of samples of interviewees and focus group participants shows an almost even split between those that identified as men and those that identified as women. It is also clear that the largest group of participants was made-up of undergraduate students (~58%), while graduate students made up about 26% of the sample, and recent graduates made up the remaining 16%. Although OSPE's member network, as well as ESSCO's member network, comprise 15 institutions, it appears that the participants attended or are currently attending one of only seven institutions that are shown in Figure 10. The majority of participants are studying or have studied at the University of Toronto. It should be noted that *all* but one of the total sample (20 participants) identified as Black or person of colour.

3.2 Qualitative Data

3.2.1 Examples of Microaggressions Experienced by Equity-Deserving Groups

During the semi-structured interviews, participants shared identities which they felt have led to people formulating conscious and unconscious biases towards them, mostly in a negative way. While there is no "positive" instance of conscious or unconscious biases that participants have shared, some have stated that being a "model minority" although disguised in a positive context, has brought about many negative implications. Some of these negative implications include having greater amounts of pressure put on individuals, by peers, lecturers, friends, and family, to excel in their academics or achieve the highest grades in their courses.

Firstly, there was no significant distinction drawn between the experiences shared by undergraduate students compared to those of graduate students and recent graduates. Across the entire sample, there were at least 5-6 experiences shared which touched on the topic of targeted discrimination towards participants that identified as East Asian. Most of these could be classified as macro-level aggressions. The most commonly shared statement, with regards to East-Asian students, was "*Oh, you're Asian so you must be smart".* In a separate instance, a participant describes a time spent with peers where this student, of East-Asian identity, was questioned on getting low grades despite being Asian. In another instance, a participant shared that while sitting in a lecture hall, preparing for a quiz that was about to take place, another student could be overheard saying, "*I'm going to ask the smart Asians*".

In other cases, participants shared personal experiences detailing how they felt they had been the subject of targeted discrimination right after the COVID-19 pandemic began. More than three participants recall being given the "cold shoulder", receiving verbal messages or assaults from other individuals in public (outside the university), or completely being ignored. In this instance, "public" is described as anyone outside of the institution the participant is attending or attended, and/or a physical space that is outside of the institution's boundaries. Participants that shared these types of instances believe that these rude remarks and occurrences took place as an aggression towards the individuals because of their Asian identity.

Secondly, in a similar manner, participants shared that they had experienced various acts of microaggressions throughout their schooling experiences, and many of these instances occurred, in their perspective, as a result of their Black identity. Quoted below are some experiences that participants drew attention to.

"People tend to think that because I'm Black, I don't have the knowledge to study engineering".

"They're surprised I'm studying engineering because I'm Black".

"They tell me I'm not like the *typical* Black person. I don't know what that means".

"They said, "I didn't expect *you* to help me today. Or I wasn't expecting *you* to do this".

“Oh, you GO Black Queen”, when completing a task.

“I like your hair!”

In speaking with participants who self-identified as Black, some of the above quotes were mentioned repeatedly by different individuals. The last one, “I like your hair”, was especially common. Referencing another type of microaggression, one participant shared, “I was in a class where we were going around introducing ourselves and this Black student introduced himself with a name that I guess was hard for the professor to pronounce and the professor kept asking if they could just call him by his last name”. Mispronouncing someone’s name or failing to recognize the importance that a name holds to one’s identity is a form of microaggression. These are instances that have been shared between discussions about both in-person learning environments and virtual learning environments. It should be noted that this experience ended on a positive note with the professor apologizing to the student and speaking with them after the session to learn the correct pronunciation of the student’s name. The following scenario took place in-person:

> “My friend- she was entering an engineering class and the [Teaching Assistant] told her the “science classroom” was the one beside this class. She is Black. She said no, this is where I’m supposed to be. He asked for her class schedule. She showed it. He then asked for her student ID. He didn’t do this for anyone else”.

Thirdly, many participants, and primarily self-identifying as women, shared that they had experienced gender biases in interactions between peer-to-peer, professor-to-student, and TA-to-student. During the interviews and focus group discussions, some of the experiences shared were the following:

“As someone who identifies as a woman, I've faced some challenges with feeling that I need to work harder to get the same opportunities and get the same job opportunities as my male counterparts”.

“I feel like I need to earn marks and then feel that my value comes from marks that I earn. Part of that is just ingrained in the way that education is run”.

“I have had people make offhand comments about a “woman's place” is in the home or in the kitchen”.

Participants also shared instances in higher education of supervisors denying personal rights or involving themselves in personal matters that have nothing to do with work-related matters (e.g., if you want to be in XYZ position, you cannot have children; constantly asking a woman if she plans on having children). Again, these are only a fraction of the experiences that women in engineering experience on a frequent basis.

Some things that are common between the three priority groups discussed above, with an

emphasis on equity-deserving groups, are that almost 75% of participants felt that during their schooling experience, peers would often make assumptions about the technical capabilities of racialized persons or those that are visibly non-White. These assumptions led to countless instances of being assigned to “easier” tasks, like scheduling meetings or writing the introductory or concluding statements in a technical lab report or engineering paper.

3.2.2 Comparison between In-Person and Virtual Learning Environments

Comparing the responses and experiences of participants shared during the interviews and focus groups, it is evident that microaggressions experienced by equity-deserving groups in engineering across higher education have in some way transferred over to the virtual learning environment. A participant shared the following:

> “I had a TA who sorted the students (in a Zoom meeting) into breakout rooms and I noticed I would always get grouped with all the other East Asian students, which is not weird or bad per se, but [this happened repeatedly]. [I mentally questioned why this was happening] and then noticed, [based on conversations with peers] that this particular TA was grouping everyone based on their perceived ethnic makeup. [As an example], there was a group of all White girls, a group of White guys, and a group of [only] South Asian people”.

There are other instances where participants shared instances in which peers will select group members in a virtual setting based on the origin of the classmates’ names. For example, many of the East Asian-sounding names will get picked first or peers will want to work with them because they stereotypically perceive them to be *smarter* than the rest of the class. From the data gathered, it seemed that there was an almost even split between participants feeling that these microaggressions had translated into virtual learning environments. Some participants shared that they felt more comfortable participating in class discussions virtually because, without their camera on, no one could stereotype them as they typically would in an in-person classroom environment.

3.2.3 Distinctive Scenario

There are many voices missing in this research. For one, this research was not able to gather experiences from participants that identified as having an Indigenous background. It also did not capture experiences specifically relating to the 2SLGBTQ+ community, or persons with disabilities. Intersectionality plays an integral role in understanding the experiences of individuals that identify with one or more equity-deserving groups. One isolated instance shared is described below (pseudonym used):

> “When contacting a vendor for one of my work projects this past week, I was addressed as “Mr. Heather Lawson”. Initially, I presumed it may have been due to cultural differences and assumptions pertaining to the roles of men and women (the vendor was located in India). After I added my pronouns to my email signature, I was addressed as “Sir” by a

different employee from the same organization. When I shared the experience with someone who is part of both the LGBTQ+ and BIPOC community, he mentioned that it may have been an intentional mis-gendering, stemming from an assumption that the fact I emphasized my pronouns was an indication of being a trans woman rather than CIS. The person who brought up this explanation shared that he has had similar experiences where people have intentionally used “She/Her” pronouns in direct rejection of his identity”.

This emphasizes that the reality is, this represents only a *fraction* of the experiences dealt with by equity-deserving groups affected in the above scenario.

3.2.4 Impacts on Academic Performance and taking on New Opportunities

When questioned about what the implications of facing or experiencing some of these microaggressions were, participants across interviews and focus groups unanimously agreed that these experiences can only *negatively* impact or hinder one’s performance in academics and in their career. It leads to lost confidence and self-esteem, prevents students from reaching their full potential, discourages them from participating in fields of interest, and overtime, forces them to pull away from those they once confided in. Some examples shared by participants include the following:

- Students feeling less confident in their communication skills because English is not their first language
- Prevents students from fully participating in activities
- Might feel unsafe, or targeted by other students
- Hinders students from reaching their *full* potential
- Lecturer assigns tasks generally but when students get together, they pick or assign the “easier” tasks to equity-deserving students
- Discourages students from participating and gives them more of a “coffee-maker” role
- When a student did participate and gave suggestions, their suggestions were completely removed/ignored from the final version of the presentation slides
- Microaggressions and comments cause individuals to pull away from participating in group settings

3.2.5 Perceived Value of Conversation(s) on Microaggressions

In discussing the potential value of raising awareness on this topic, participants shared that this was especially important because they, themselves, did not fully understand what could be considered a microaggression until participating in this research. Shared below are some observations raised by participants:

- “It is important [to have these conversations] because experiences between BIPOC and White individuals are different, and we should all be aware of challenges that others face”;
- “Before this research, I never thought that something so small could be a microaggression and have impacts. During the 1-on-1 interview, I could only think of one example, but now I can see that many experiences have been microaggressions, but I’ve minimized their value in the past”; and

- “Recognizing unfair advantages White individuals have in comparison to marginalized individuals advocates/allows for equity and skills workshops/opportunities for marginalized individuals”.

3.3 Recurring Themes and Summary of Observations

Based on the responses collected during interviews and group discussions, there were three major recurring themes among the participants, as listed below:

1. Anti-East Asian discrimination has become more prevalent since the start of the pandemic and many identifying equity-deserving students are concerned that this will continue;
2. Anti-Black discrimination has been experienced repeatedly and students feel that microaggressions towards Black individuals is a growing concern that often goes unnoticed; and
3. Gender biases and double standards towards women is a common form of micro- *and* macro-level aggressions that have appeared across both in-person and virtual learning environments.

Another point is that there were distinct experiences shared which need to be explored further to understand the frequency of those types of microaggressions towards not only on groups described here, but other equity-deserving groups as well. As an example, there was an instance shared about direct rejection of someone’s gender identity on transgender persons. These instances can quickly transcribe into macro-level aggressions which need to be identified and shed light.

Further, it is not uncommon to see the same microaggressions appearing in both in-person and virtual learning environments. In fact, many participants felt that new forms of microaggressions had been appearing in virtual learning environments, showing that virtual classrooms are not exempt from these types of occurrences.

Chapter 4. Learning Outcomes and Conclusion

4.1 Discussion

Based on the qualitative analysis performed on the gathered data from the interviews and focus groups, all research questions have been answered. Regarding whether the majority of equity-deserving groups in engineering have experienced some form of microaggression during their schooling experience, it is evident that *all* participants have indeed experienced microaggressions. Whether these experiences took place in an in-person or online setting is described in the research findings section. There was not a single participant that stated they had *never* experienced, witnessed, and/or overheard forms of microaggression.

These experiences have negatively hindered academic performance and/or opportunities to participate in activities relating to professional development of equity-deserving students in engineering. Incidents where students have been perceived to be less capable of carrying out technical tasks or assumptions being made on how intelligent one is because of their ethnic background are all examples of instances that have contributed to the loss of confidence in these students as they navigate their educational experiences.

Finally, the experiences shared of microaggressions transferred between learning environments when the COVID-19 pandemic forced in-person learning to become virtual learning have been documented. While not all students that experienced microaggressions during in-person learning have seen the same or similar instances in virtual learning environments, there is still, to some degree, a prevalence of microaggressions occurring in peer-to-peer interactions, and TA-to-student interactions. There are even new forms of microaggressions taking place that could be widely applicable to *all* virtual learning, like stereotyping people based on the ethnic origin of their name.

4.2 Mitigation Strategies and Next Steps

While this research serves simply as a *snapshot* of microaggressions experienced by equity-deserving groups in engineering across higher education in Ontario, there are immediate steps that can be taken to address the issue. OSPE's Diversity and Inclusion Task Force was consulted in establishing these mitigation strategies.

1. **Invest**

   As institutions strive to achieve greater enrolment numbers for equity-deserving groups, they rely on members of the community to advocate for the change they want to see. It is important for leadership to invest in students by creating more *paid opportunities* to actively foster inclusive environments at the institutions. Examples of paid opportunities could include, for example, developing research projects, jointly funded by an industry and an academic institution.

2. **Educate**

   It is important, now more than ever, to record and document these instances so that pressing topics, like microaggressions, can be addressed immediately with faculty, and governing members at respective institutions.

   Hosting workshops and/or webinars, interactive sessions, and other forms of communication to discuss what some of these terms, like microaggressions, mean are *vital* to bringing everyone together and ensuring there is no reason for anyone to not be on the same page. It serves a timely reminder that silence plays an important role in perpetuating systems of oppression and injustice (Bir, 2021).

3. **Expand**

   Collaborating with other institutions and organizations and bringing together Non-governmental Organizations (NGOs) and other grassroots organizations that are striving to make a positive difference can play a strong role in fostering meaningful relationships that could be the start to an impactful journey for many students.

4. **Engage**

   While equity-deserving persons sometimes feel that the onus is always on them to raise awareness and educate others about why the experiences they have undergone are dismantling, it is important to recognize the power that equity-deserving groups' voices can have in our society, especially in higher education.

4.3 Summary and Concluding Remarks

There is limited data publicly available which showcases the demographics of the engineering student body across all of Ontario, except for women. According to Engineers Canada (2021), the enrolment number of engineering students that identify as women still remains below 30%. In 2019, female undergraduate enrollment was 23.4% (Society of Women Engineers (SWE), n.d.). Engineers Canada's 30 by 30 initiative has a goal of raising the percentage of newly licensed engineers who are women to 30 percent by the year 2030 (Engineers Canada 2021).

Through an examination of past studies and text, it is evident that the most common examples of prejudice faced by marginalized communities, including equity-deserving individuals, in the engineering industry include bias and double standards for those community members. It stereotypes a group as less competent at engineering than the majority demographic of engineering- in Canada and the U.S. - white men. Individuals from equity-deserving groups commonly experience this type of bias in their engineering studies when others assume that they are inexperienced, unqualified, and incapable of carrying out the same tasks that the majority

demographic would be responsible for. Stereotypical advances towards equity-deserving persons can hinder one's performance and result in individuals who experience this type of prejudice to feel that they need to prove themselves capable to those around them. In academic institutions, a common example of prejudice experienced by equity-deserving persons occurs in lab settings where students will often think of women as less adept at carrying out physical hands-on tasks, such as lifting concrete blocks for testing. Of course, gender bias is only *one* example of prejudice in the engineering community. Another common example is when an international student or even a student born and raised in the same community as the majority demographic speaks with an accent and has their thoughts and opinions overlooked by others because those around them do not allow the opportunity for the individual to articulate their thoughts.

Existing barriers from accessing opportunities while in school, like not having the financial or other relevant means of attending conferences, seminar presentations, workshops, and completing internships abroad, can often be carried over to workplace settings and enable feelings of exclusion from the wider team culture. Often, these barriers lead to feelings of inadequate preparation for the industrial setting.

In reviewing barriers that have been identified and documented, it was found that gender biases, financial constraints, family dependencies, among others, were some of the most common barriers to exist in engineering and other technology and architectural science fields. Having the opportunity to participate in events and activities does not necessarily provide everything that an individual, especially someone who may come from a financially disadvantaged background, would need, to actively participate. Financial barriers are among the top factors that prevent engineering graduates from feeling confident in excelling in their careers.

All participants in this research indicated in some way or form that they have either experienced, witnessed, or overheard acts of microaggressions during their time pursuing higher education. This is extremely alarming because another finding from the study showed that at least half of the participants that claimed they had experienced these acts also stated that they did not know these were acts of microaggression until they participated in this research. This cycle of microaggressions continues because without awareness on what constitutes these acts, many students and recent graduates do not realize they have been the victim of microaggressive acts until much later or in some cases, never. It is deeply disturbing how normalized it has become to experience these things and it has simply become another social construct we need to constantly remind ourselves of.

Overall, the three main findings based on responses collected were that since the beginning of COVID, there has been a significant increase in not only microaggressions but in some cases, macro-level aggressions towards East-Asian students and recent graduates. Participants that identified themselves as being Black reported that they have experienced these acts for as long as they can remember and coming into engineering, the most common responses they received about their field of study were mostly derogatory in nature, such as, "Oh, I didn't expect to see you here", or "How did you get into engineering?" and finally, gender biases were not uncommon. Many women reported that they have been the subject of microaggressions

through lab environments and lecture settings.

It is important to note here that while these were some of the findings presently, it is only the start of uncovering what microaggressions have been faced by students in classroom environments, both in-person and virtually. Something which hasn't been touched on is the topic of intersectionality and how that has impacted those belonging to two or more equity-deserving groups, like women of colour, or someone that identifies as BIPOC and part of the 2SLGBTQ+ community.

4.4 Recommendation for Further Studies

This research is a snapshot of microaggressions experienced by equity-deserving groups in engineering across higher education in Ontario. It aims to be a starting point for a series of discussions and conversations that are much needed to embrace and foster a culture of inclusivity among *all* equity-deserving groups across higher education. Starting with higher education does not diminish the value of having these conversations in other institutional settings. Rather, this research aims to create a domino effect for sparking more conversations on this topic so that microaggressions are far out of the question and eliminated well ahead of engineering students' careers.

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Appendix A

To: Anum Khan
Civil Engineering
RE: REB 2021-233: Identifying Microaggressions Experienced by BIPOC Engineering Students across Higher Education in Ontario
Date:June 29, 2021

Dear Anum Khan,

The review of your protocol REB File REB 2021-233 is now complete. The project has been approved for a one year period. Please note that before proceeding with your project, compliance with other required University approvals/certifications, institutional requirements, or governmental authorizations may be required.

This approval may be extended after one year upon request. Please be advised that if the project is not renewed, approval will expire and no more research involving humans may take place. If this is a funded project, access to research funds may also be affected.

Please note that REB approval policies require that you adhere strictly to the protocol as last reviewed by the REB and that any modifications must be approved by the Board before they can be implemented. Adverse or unexpected events must be reported to the REB as soon as possible with an indication from the Principal Investigator as to how, in the view of the Principal Investigator, these events affect the continuation of the protocol.

Finally, if research subjects are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research.

Please quote your REB file number (REB 2021-233) on future correspondence.

Congratulations and best of luck in conducting your research.

Dr. Asher Alkoby, LL.B., LL.M., S.J.D.
Chair, Ryerson University Research Ethics Board
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Appendix B

Table 5- OSPE and ESSCO Member Institutions

Institution	**Type**
Carleton University	University
Conestoga College	College
Lakehead University	University
Laurentian University	University
McMaster University	University
Royal Military College	College
Ryerson University	University
University of Guelph	University
Ontario Tech University	University
University of Ottawa	University
University of Waterloo	University
University of Windsor	University
Western University	University
York University	University
University of Toronto	University
Queen’s University	University

Appendix C

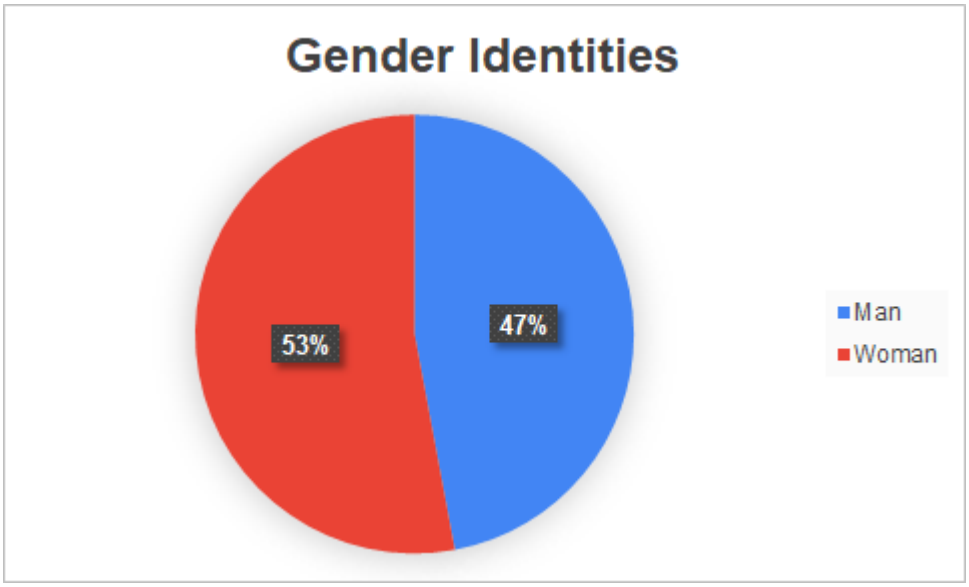

Figure 4- Interview sample by gender

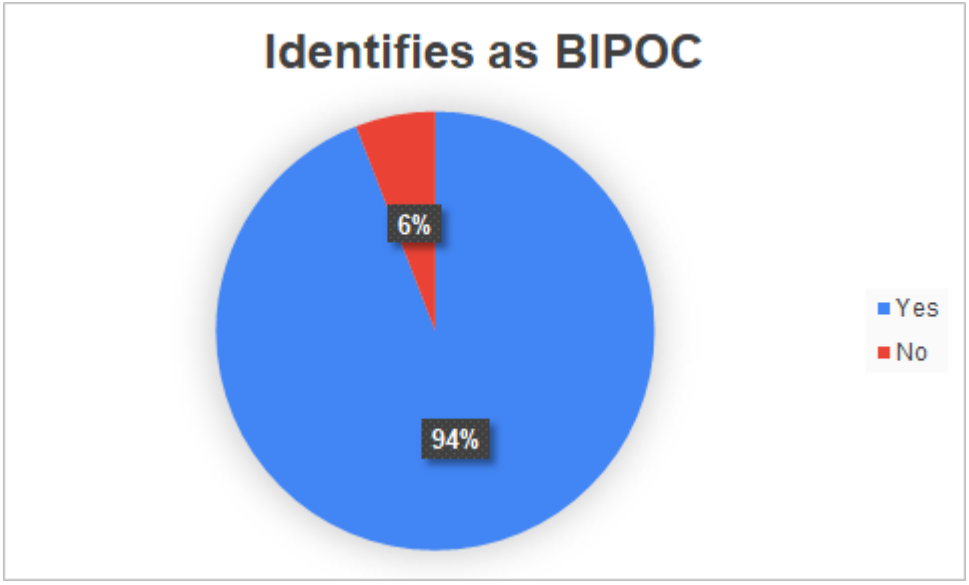

Figure 5- Interview sample by self-identified Black persons or persons of colour

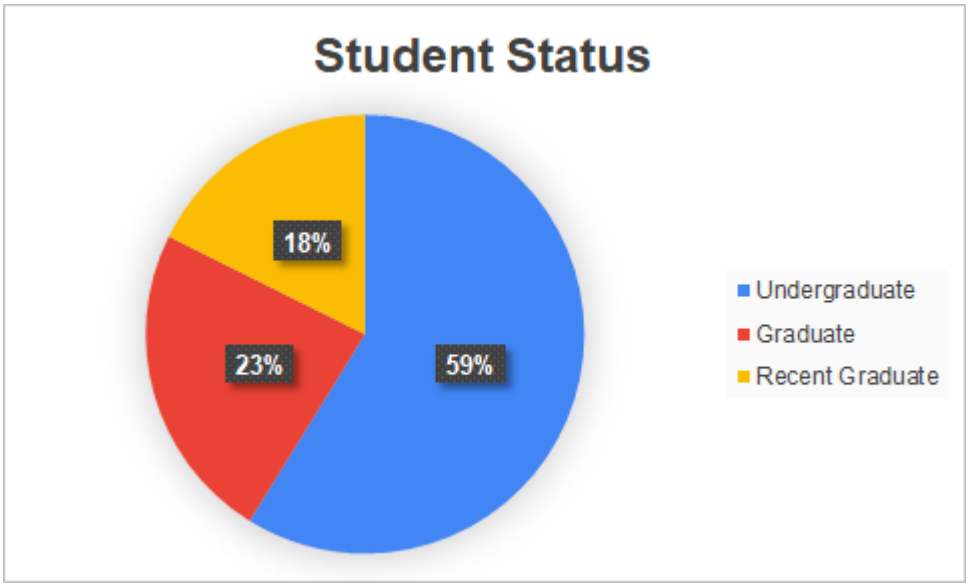

Figure 6- Interview sample by student status

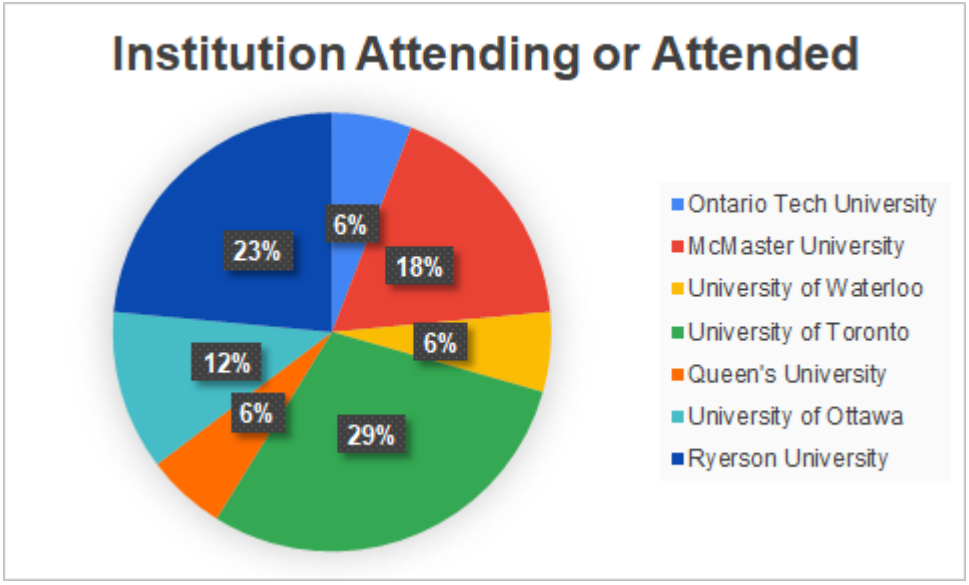

Figure 7- Interview sample by institution

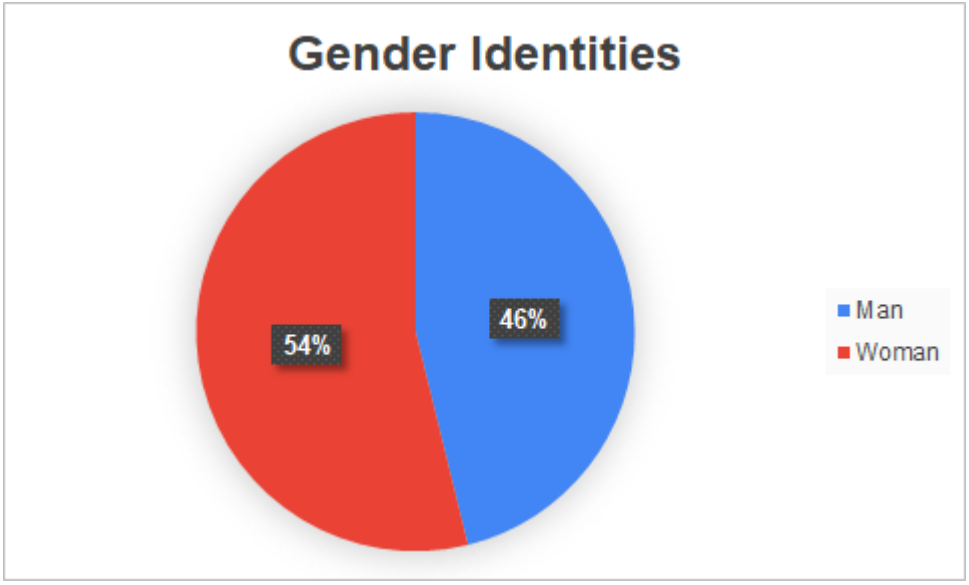

Figure 8- Focus group sample by gender

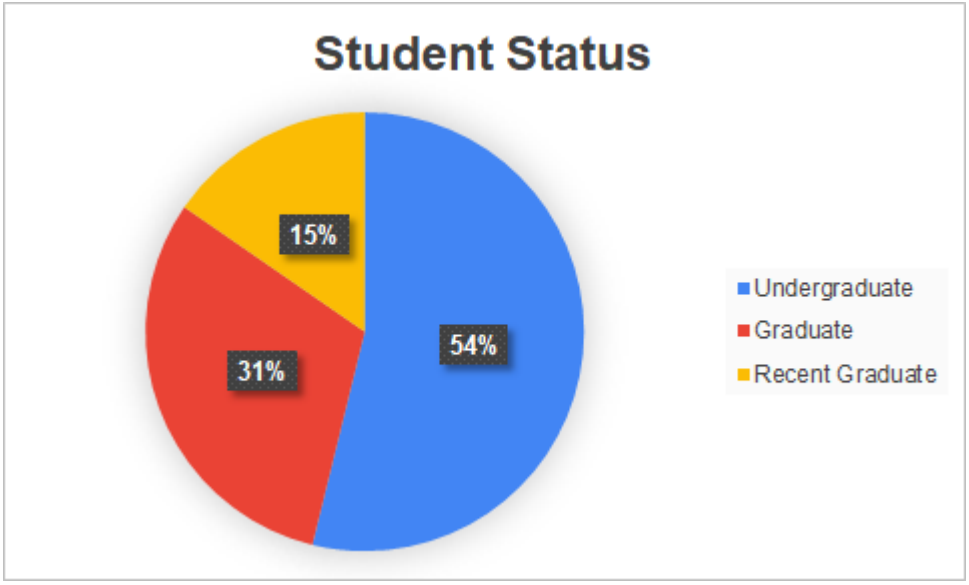

Figure 9- Focus group sample by student status

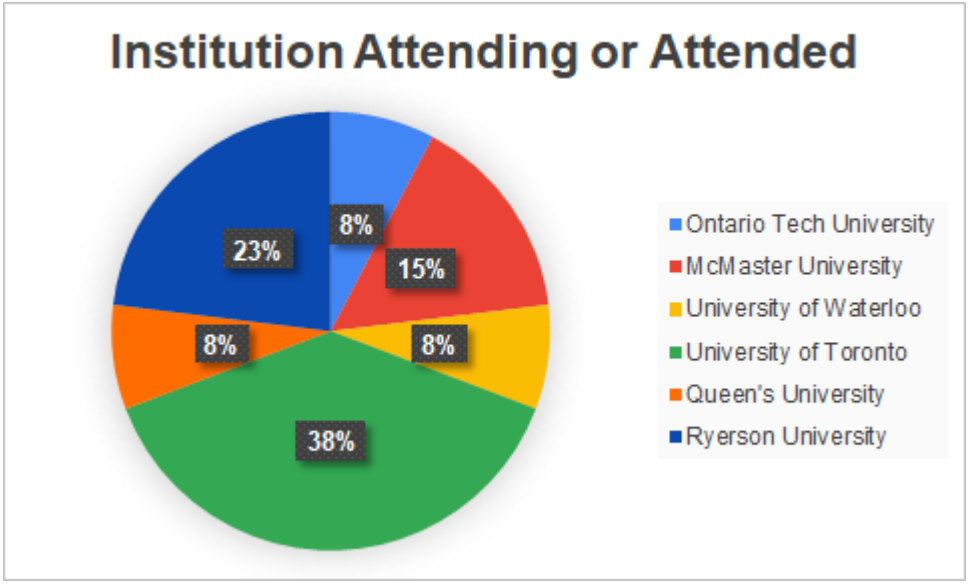

Figure 10- Focus group sample by institution