GENDERED BY DESIGN: THE SOCIALIZATION OF WOMEN IN ENGINEERING SCHOOL

by

Katarina Lauch, B.A.

A thesis submitted to the Faculty of Graduate and Post-Doctoral Affairs in partial fulfillment of the requirements for the degree of

Master of Arts

in

Women's and Gender Studies

Carleton University
Ottawa, Ontario

Abstract

The under-representation of women in engineering is a well-known phenomenon. This study explores the potential role of university experiences in derailing the journey of would-be female engineers, focusing on how engineering school may socialize women in ways that discourage them from the field. Semi-structured interviews with 16 female Ontario university undergraduate engineering students were conducted and were analyzed from a feminist epistemological standpoint, privileging the experiences and voices of participants. Organizational socialization, gender socialization, and social identity theories guided the identification of important themes and issues. Results suggest that women are receiving information pertaining to the proficiencies, people, politics, and organizational goals and values of this space, potentially shaping their self- and field-based perceptions in negative ways. Many participants expressed pessimistic views about engineering, and often alluded to and discussed sexism. Some women also expressed feelings of visibility, discomfort, and/or feeling "unsafe". The normalization of gender-based (mis)treatment via interactions with peers and role models may foreshadow women's future careers in engineering.

Acknowledgements

I cannot express the extent of my gratitude towards my supervisor, Dr. Angela Dionisi. Thank you for your patience, diligence, and for being an invaluable supervisor and role model.

I would like to thank Dr. Katie Bausch for demonstrating to me how to be a kind and supportive teacher, for always providing support, and for understanding when my thesis took time away from my teaching. Thank you to Dr. Merridee Bujaki for helping me question the system, rather than those within it. I would also like to thank Dr. Grace Adeniyi Ogunyankin for pushing the quality of my writing to a level that I never thought possible.

The completion of this thesis would not be possible without the support of my friends and family. Thank you to my partner Riley for taking on the majority of the unpaid labour at home, and for telling me that I could keep writing when I felt like I couldn't.

Thank you to my brother for always keeping me humble, as younger brothers should. I would like to thank my Oma and Opa, two of the smartest people I know, for their invaluable support along the way. Thank you to my father, for always believing in me and for always pushing me to do my best in everything that I do.

Finally, I would like to thank my participants for sharing their stories and experiences with me. You made this project possible.

Dedication

For my mother, who has always shown me what a strong woman looks like and who has helped me through every step of this thesis. I definitely could not have done it without you.

Table of Contents

Chapter 1 Setting the Stage

Yeah I think it's just… it's just obvious that we're not… quite equal. Between male and female. It's just not…sometimes it's just not fair.

Meredith

The under-representation of women in engineering is a well-known phenomenon. While women in engineering schools are in the vast minority, practicing female-identifying[1] engineers are even fewer to be found. In Canada, twenty-one percent of engineering students are women (ONWiE, n.d.a), and women make up 19.3% of engineering graduates ("Women in Engineering", 2017). However, as women progress to the workplace, this number drops dramatically: less than 13% of practicing, licensed engineers are women (ONWiE, n.d.b). Unfortunately, this gap not only exists in Canada, but in English-speaking countries worldwide (Powell et al., 2012). While research has explored the factors that may be contributing to the under-representation of female engineers within the workplace (e.g., Cech et al., 2011), the role of one's university experience in derailing the journey of would-be female professional engineers[2] has garnered less academic attention. My goal for this research was to explore whether and how the (gendered) messages communicated to women during their socialization into undergraduate engineering programs, may foster feelings and perceptions within female students that subsequently encourage them to leave this field.

In this introductory chapter I first discuss the research that has been produced to date, that attempts to explain why women have historically been underrepresented in the fields of Science, Technology, Engineering and Mathematics (STEM) more generally. Following this, I outline the larger aims of this research, situating the current investigation within the literature, and

---

[1] Hereafter referred to as female
[2] In this research, a professional engineer constitutes someone who works in this field as an engineer, and may or may not have their Professional Engineer (PEng) designation.

highlighting the potential contribution of this investigation. The chapter concludes with an outline of this thesis as it will proceed thereafter.

What has previous research found?

Women's underrepresentation in STEM fields has previously been attributed to stereotypical gender roles and their rigidity within organizations. For example, a study by Lester (2008) reveals that women's stereotypical roles in society are often carried over into the workplace; women are often given characteristically feminine tasks and roles (i.e. related to care and people) causing them to miss opportunities that are considered to be more "masculine" (i.e. STEM career paths). Workplace expectations further mirror stereotypical gender roles; women attempting to access male-dominated career paths have found that behavioural expectations placed on them in the workplace, differ from the expectations of their male colleagues (Oakley, 2000). For example, Oakley (2000) explains that women in leadership positions are expected to exhibit traditionally masculine traits such as authoritativeness and toughness. However, women who do perform these traits are perceived as "bitches" if they act assertively (Oakley, 2000).

Ample research also exists highlighting the damaging effect of STEM's masculine workplace culture. A study by Bastalich et al. (2007) emphasizes the masculine environment of engineering workplaces as a contributing factor to women's underrepresentation. This study emphasizes the incongruency of women existing in a space built on masculine norms, stating that male-dominated workplaces isolate women structurally (e.g., lacking adequate family-friendly policies), and socially (e.g., as a masculine environment is not welcoming to femininity). Meyer (1999) also uses a study on automotive work culture and worker grievances to demonstrate the potential hostility of a highly masculine environment, while Gale (1994) explains that a masculine work culture is both overtly and covertly reproduced and perpetuated.

Some research on the topic of women's underrepresentation in male-dominated fields has also focused on training women to overcome the obstacles that they may face in the workplace (e.g., Ayre, 2013; Buse, 2013). However, this perspective places the responsibility on women to fit into a model that was not built for them (i.e. engineering workplaces) (Powell, Bagilhole, & Dainty, 2009). Similarly, some research emphasizes the importance of agency in women's representation in engineering; a study by Ayre et al. (2013) suggests women should seek supportive work environments and recommends that managers work to validate female engineers' skills at work. Whereas the recognition of women's proactivity is important in this sphere, this study focused on a feminist perspective that questions the environment itself, as opposed to recommending that women alter their career choices or behaviour in order to mitigate these issues.

To this end – and particularly pertinent to the current investigation – some researchers have sought to determine how academic experiences may contribute to women's underrepresentation in STEM fields. Brainard and Carlin (1998) for example, investigated the importance of female students' initial self-confidence to their persistence in studying science and engineering, and found that negative school-specific self-perceptions lead to students leaving the field. Similarly, Robnett and Thoman (2017) found that female students' negative perceptions of their academic achievement often lead them to switch out of STEM disciplines. This study also showed that perceived low success in school did not necessarily relate to students' actual performance; many students who perceived themselves to be low-performing (and subsequently switched disciplines) were not, in fact, low-achieving academically. In a comparable study of students' GPAs in relation to persistence, Takahira, Goodings, and Byrnes (1998) found that students of high academic achievement were more likely to persist in core engineering courses. Other studies have focused on the college or university programs themselves in order to gain an

understanding of gender disparity. For example, gender ratios in programs seem to matter – being outnumbered in an environment (i.e. few women surrounded by men) can cause women to feel unwelcome (Ramsey et al., 2013). Moreover, Griffith (2010) showed that the higher the percentage of female STEM graduate students in a university, the more likely undergraduate female students will persist in STEM programs.

Finally, Powell et al., (2009) studied the co-op experiences of female engineering students to determine whether the performance of gender in the workplace can cause difficulties for those who do not conform to the dominant gendered culture. In this study, women engineering students were found to perform their gender in a certain way in order to gain acceptance into the masculine culture around them; participants were found to have performed masculinity and outwardly rejected femininity in order to fit in (Powell et al., 2009). Seron et al. (2015) explain that the key to women's persistence in engineering school is not related to the students themselves or to the curriculum; this study found that the social and cultural aspects of the engineering school environment (specifically, orientation week and initiation rituals) affected women's commitment to remaining in this field. Thus, in previous research, the nature of the environment has been found to be a major contributing factor in women's retention (or lack thereof) in engineering and in male-dominated fields more broadly.

Statement of Intent

This research project provides a unique approach to women's underrepresentation in a male-dominated field. Whereas previous research has examined the effects of stereotypical gender roles on the workplace, the characteristics of women themselves in STEM fields, and the workplace environment surrounding women, this study proposes that the engineering school environment is a socialization ground for the field. Moreover, research investigating gender and work has previously used a framework wherein the male versus the female experience is

compared, with the male experience serving as the baseline (Ranson, 2003). Given that

engineering is a masculine space, positioning women's experiences in opposition to men's

experiences serves to reinforce the differences between the feminine and the masculine (Ranson,

2003). This research project focuses solely on women's individual experiences as valuable

insights into structural and systemic issues, as opposed to in comparison to men. To do so, I use

semi-structured interviews conducted with undergraduate female engineering students at an

Ontario university. A feminist perspective embedded in qualitative research practice allows me

to privilege the voices of my research participants and investigate the factors in engineering that

influence them. I explore women's perceptions of themselves within their program, as well as

their perceptions of peers, professors, and their overall experiences within the engineering school

environment. Moreover, I use gender socialization theory to analyze the embedded masculinity

of the engineering school space itself (Carter, 2014), and social identity theory to investigate the

potential role of group memberships and identity formation in women's engineering school

experiences. I also frame this research within organizational socialization theory, using it to

dissect the dynamics of this environment and analyze how the information and messages

communicated to women in various ways, affect their perceptions. Ultimately, these theories are

used to examine the many ways in which young women could be receiving messaging that tells

them that they do not belong in engineering.

This research is important for several reasons. First, this study sheds light on important

dynamics that could be contributing to the under-representation of women in the engineering

profession, potentially revealing an earlier phase of this systematic problem. For example,

findings may reveal that the treatment young female university students experience on campus

and from their peers, fosters damaging attitudes and perceptions within these women, which may

contribute to their eventual withdrawal from the profession. This study thus provides the

opportunity to further develop the theory in this area, and contribute to the growing body of research on gender in STEM.

Second, this study provides insights that can be used by post-secondary institutions to target destructive components of their organizational culture. For instance, if it is revealed that certain classroom dynamics are perceived by female engineering students to be derogatory, discriminatory, or otherwise damaging in gender-based ways, universities can then use these insights to take directed, corrective action – and by extension, encourage a greater number of women engineering students to complete their degrees and gain employment in the field.

Finally, the qualitative nature of this inquiry gives women engineering students a platform to share their lived experiences of a male-dominated space (in their own words), and to voice any concerns in a safe and respected way. Moreover, this study serves as a platform through which these women can contemplate and exercise resistance against the marginalizing experiences they encounter. Thus, this study ultimately aims to remove the misplaced responsibility and blame bestowed on women engineers who have experienced gender-related discrimination, and instead interrogate the social culture and environment they are in.

Outline

This thesis proceeds in 7 chapters towards its conclusion. In Chapter 2, I outline and expand upon the theoretical perspectives used in this study. I introduce each theory, explain the roots and implications of each perspective, and apply them to the current research. Moreover, a feminist theoretical framework guides this project, focusing on women's individual experiences. In Chapter 3, I outline my research method and methodology. In this chapter, I discuss the processes involved in creating this project, the difficulties of navigating a feminist research process, and data collection and analysis. Chapters 4-6 present the key themes and findings revealed through this study. These chapters dive into trends that were discovered throughout the

project and the potential implications of these findings. More specifically, in Chapter 4 entitled "Outnumbered," I explore the potential effects of women's numerical underrepresentation in engineering school, discussing how this could affect women's perceptions of their place within this environment. Chapter 5, "Nobody's laughing: humour and objectification" discusses various peer-based interpersonal dynamics that may cause women to feel singled out, othered, and objectified. Chapter 6 called "Threat in the air" showcases how the normalization of gender-based violence can reinforce dangerous narratives and fuel women's feelings of discomfort and lack of safety in this space. Finally, Chapter 7 concludes this project with a summary of my findings, coupled with a discussion of the broader significance of this study and its results. Together, this work contributes to a greater understanding of the challenges faced by would-be female engineers as they pursue their post-secondary education, and by extension, the role played by the engineering school environment in perpetuating the underrepresentation of women in the field of engineering.

Chapter 2 Theoretical Perspectives

In this study, I analyze the experiences of young women in engineering school using three theoretical perspectives – organizational socialization theory, gender socialization theory, and social identity theory. These three theories are combined to analyze how gender, self-perceptions, and a sense of "fit" are experienced and/or shaped in engineering school, and in turn, may help explain women's underrepresentation in the field of engineering more broadly. This study stems from a feminist epistemological standpoint that privileges the experiences and voices of the participants. As discussed below, this study considers whether and how engineering school may act as a key socializing agent for would-be female engineers, ultimately signalling to these individuals what life may be like working as a professional. The gendered messages being communicated to women during their educative experiences, may very well be fostering feelings and perceptions that subsequently encourage them to leave this field; these patriarchal messages could be negatively impacting how female engineering students view themselves, the field of engineering, and their place within this industry.

Epistemological Framework

Epistemology, the theory of knowledge production, originates from philosophical doctrine. This research project comes from a feminist epistemological standpoint because it aims to affect social justice and overcome inequalities using a framework that places gender at the center of inquiry (Hesse-Biber, 2014). It is crucial to employ a feminist framework in research projects that surround women's experiences, as such an approach recognizes that marginalized demographics have historically been removed from knowledge production (Smith, 1974). More specifically, knowledge production has been by and for the dominant social group, predominately, white men in power (Code, 2014). Thus, a feminist research methodology questions the foundations of knowledge production and the oppression of marginalized people,

and in turn, aims to positively affect marginalized individuals by providing a space for marginalized voices (Brooks & Hesse-Biber, 2006). This feminist research project places women's individual and unique experiences in engineering school at the center of inquiry, ultimately seeking to produce knowledge that comes from the perspective of women engineering students themselves. When considering the specific context of this research, the necessity of a feminist epistemological standpoint and treating women as knowledge-producers, becomes even more palpable. Engineering, a predominately male space (Bastalich et al., 2007; Gale, 1994), has historically been shaped by and for men without the perspectives of women. Creating knowledge about engineering, the environment, the culture, and gender issues with the voices of women engineering students, may thus shed light on potentially hostile socialization processes and experiences that have been overlooked by those who are not marginalized in this arena. This study constitutes feminist research as it aims to investigate an injustice: the lack of female representation in the field of engineering. The following three primary theories inform this analysis.

Organizational Socialization

Organizational socialization manifests as individuals move into new organizations and professions. More specifically, organizational socialization refers to the role of a workplace, school, or club (for example) in shaping the expectations, beliefs, and behaviours of individuals within that space (Van Maanen, 1978). Schein (1988) defines organizational socialization as what occurs when an individual enters a new organization and becomes a part of it. This process includes learning the values, norms, behaviours, and expectations of said organization – necessary for any new member to ascertain in order to fit in (Schein, 1988). In fact, there are a variety of different types of information – or "content areas" – that newcomers must grasp during socialization (Chao et al., 1994). For instance, newcomers must learn about *performance*

proficiencies (i.e., the skills, knowledge and abilities required for the job), *people* (i.e., the creation and fostering of relationships with one's colleagues or peers), *politics* (i.e., determining power structures, hierarchies, and navigating the social structure of the environment), and *organizational goals and values* (i.e., recognizing the broader rules and norms of an organization) (Chao et al., 1994).

Organizations may employ different strategies to socialize their members. For instance, some organizational socialization takes place informally, through the day-to-day execution of the intended role within the work/learning environment (i.e. what is referred to as informal socialization; Van Maanen, 1978). Applied to the current context, female engineering students may thus be learning a great deal about the dynamics of engineering while attending classes, participating in tutorials, or otherwise completing their course work and extra-curricular activities. Moreover, more senior members of an organization can impart knowledge onto new members (i.e. what is referred to as serial socialization; Van Maanen, 1978), or socialization can take place at the hands of one's peers (i.e. what is referred to as disjunctive socialization; Van Maanen, 1978). Women in engineering school may thus be exposed to various socializing agents throughout the university experience, taking the form of classmates, professors, and/or staff.

Importantly, organizational newcomers display a certain "readiness" for socialization; newcomers seek information that can help them acclimate to their new environment and minimize the stress and uncertainty that comes from entry into a new setting (Bauer et al., 2007). Individuals entering a new role look for cues when it comes to what is required of them (i.e., referent information), how to successfully execute their role (i.e., appraisal information), and how they should relate to and interact with others around them (i.e., relational information) (Bauer et al., 2007). Thus, that female engineering students would be receptive to the messages being imparted to them during their time in engineering school, is plausible.

This study uses organizational socialization theory to understand how engineering school may be shaping the attitudes and beliefs that female engineers develop about this field and their place within it. While organizational socialization theory has traditionally lacked a gendered lens, this study seeks to expand on this theory using a feminist perspective. While the organizational socialization process is one meant to bolster the commitment, engagement, and performance of its members (Chao et al., 1994; Bauer et al., 2007), might this same process have the opposite effect when it comes to women attempting to join a decidedly masculine space? Whereas this theory is agendered, the socialization of young women into a masculine domain warrants a decidedly gendered perspective – one that is rooted in the social construction of gender.

Gender Socialization

In an analysis of gender and culture, it is imperative to explore the roots and implications of gender and its creation. Gender socialization theory maintains that, rather than being biologically determined, gender is socially constructed through environmental forces (Carter, 2014; Connell, 2005). More specifically, from birth, children are assigned a gender based on their sex, and are subsequently socialized into a gender role through material items that further provide cues for expected femininity or masculinity (e.g., pink and blue wardrobes that serve to indicate girl or boy, respectively) (Stockard, 1999). Conditioning and reinforcement of behaviours, activities and companions that are congruent with one's gender role, begin during infancy by agents of socialization (i.e. parents, caregivers, teachers, peers) and continue throughout one's life, ensuring that gender is embedded and perpetuated in all interactions (Stockard, 1999; Carter, 2014). Thus, gender, and by extension stereotypes surrounding masculinity and femininity, reflect social constructs that subsequently affect our life trajectories and all that we do (Carter, 2014).

Importantly, previous research has demonstrated the ramifications associated with violating one's gender role. For example, a number of studies have shown how both women and men who behave in ways that contradict traditional notions of femininity and masculinity (respectively), routinely experience sex-based mistreatment (e.g., Berdahl, 2007; McLaughlin, Uggen & Blackstone, 2012; Waldo, Berdahl, & Fitzgerald, 1998). As engineering is undeniably a masculine profession (Bastalich et al., 2007), for women, engineering may be seen as an *in*appropriate way of "doing gender" (West and Zimmerman 1987), and as a result, female engineering students may experience various forms of messaging – and (mis)treatment – from others in the environment.

At the same time, in line with Carter's (2014) theory of gender socialization, this study purports a systemic-ecological perspective, emphasizing how gender socialization is reinforced continually throughout our lives, and comes from one's environment. For example, jobs and skills are gendered, and men and women have traditionally been thought to belong in different environments and to different career paths (Carter, 2014). Engineering is a traditionally masculine space because gender socialization has taught men that their skills are technical and that an appropriate career lies in the field of engineering. The masculine nature of the field is then reinforced by the embedded and subconscious associations with technical fields and expected masculinity, and perpetuated through the performance of gender within the workplace (Lester, 2008). Throughout this study, gender socialization theory is used to interpret the roots of engineering as a masculine space, as well as the incongruency of women's existence within this space, by virtue of their gender. Gender socialization theory is further used to provide insights into how engineering school itself acts as a socialization ground for the masculine field of engineering. This socialization shapes the "ideal" engineer, the treatment of women in this space, and may affect whether students remain within, or leave this field. Importantly, these processes

are also influenced by desires to be socially accepted and/or the drive to keep group memberships exclusive – or in other words, are impacted by social identity.

Social Identity Theory

Social identity theory (Tajfel, 1979; Tajfel & Turner, 1986) argues for the importance of group memberships to how people come to view themselves as individuals. More broadly, social identity reflects individuals' perceptions of the social groups to which they belong (Luhtanen & Crocker, 1992), which may include any number of memberships such as those based on race, nationality, sexuality, and of course, gender. Moreover, social identity theory proposes that group memberships shift and change over time, including a continuous accumulation of additional group memberships with age, such as aligning one's self with a sports team, a family, a religion – or in this case, potentially a profession. Further, an individual's sense of self and identity grows within a group as the individual exaggerates similarities between themselves and other members of their group, while exaggerating differences between themselves and those in other groups (Tajfel, 1979). An individual's identity is thus shaped not only by the groups to which they belong, but also in opposition to out-groups (Lyons & Schweitzer, 2016). Foundational to this analysis, masculinity is constructed in opposition to femininity, which is viewed as inferior in a hetero-normative social context (Sang et al., 2014; Powell, Bagilhole & Dainty, 2009). Further, theorists argue that while rigid, the masculine social identity is threatened by women's entry into a masculine space (Schilt & Westbrook, 2009). When applied to this study, it thus seems plausible that the presence of women in the male sphere of engineering may be met with resistance manifesting in particular forms of treatment for these students, essentially as a way of policing gender non-conformity and the threatening of in-group dynamics (West & Zimmerman, 1987).

Relatedly, the groups to which individuals belong are a source of self-esteem, of pride, and of meaning; how individuals feel about themselves is dependent on the extent to which these social groups are valued and compared favorably with others (Luhtanen & Crocker, 1992). At the same time, recognition that one's social group is devalued can result in poor well-being. For example, sexual minority men and women exposed to heterosexist events and attitudes display higher levels of psychological distress and poorer physical health (e.g., Szymanski, 2005; Waldo, 1999). Similarly, being vicariously exposed to sexist behavior negatively impacts the gender-based self-esteem of women (Dionisi & Barling, 2018).

Within this study, social identity theory is thus used to analyze what it means to be an engineer and, subsequently, what it means to be a woman in engineering. More specifically, women engineering students could be conceptualized as simultaneously holding both "insider" and "outsider" status. By virtue of being in the engineering program, female engineering students represent in-group members with those in the larger social environment. Yet, at the same time, by virtue of being women, female engineering students represent out-group members within a traditionally "male" space – a social identity which may be reaffirmed and perpetuated by those in the environment, as a way to protect the masculine nature of this space.

Research Questions

Using a combination of the theoretical perspectives above, I explore whether and how the day-to-day experiences of would-be female engineers within the academic setting, communicate messages to these students that ultimately produce damaging, long-term effects. More specifically, I address the following overarching research question by conducting face-to-face interviews with sixteen female engineering students: *How might the engineering school environment be shaping the self- and field-based perceptions of female engineering students, in ways that may dissuade them from this profession*? To answer this broader question, the

interviews focus on the lived experiences of women in the classroom (e.g., exploring their perceptions of gender representation in this sphere, treatment by professors), as well as during social activities (e.g, the gendered, "othering" messages that women may encounter at school-sanctioned parties and events). The interviews also seek to determine how subjects perceive other students in their program, and in particular, how they view men, women, and themselves in relation to these groups. Through this line of questioning I attempt to discern what specific messages women are receiving about their chosen field and place within it, and the types of information fostering these perceptions of engineering spaces.

Chapter 3 Research Method & Methodology

In this study I employ qualitative, semi-structured interviews to investigate the experiences and perceptions of female engineering students at an Ontario university. This chapter explores my research methodology, details the suitability of my chosen method for my research question, provides information on my participants and the steps taken to conduct my research (e.g., recruitment methods, the research process), and concludes with a discussion of my social location and status as an insider / outsider.

Feminist Epistemology and Qualitative Research

I believe that feminist epistemological standpoints are imperative in analyses of gender issues, and the knowledge I produce relies on an understanding that participant voices and experiences provide value to a project. I consider my research as coming from a feminist epistemological standpoint because it aims to affect social justice and inequalities, and it uses a framework that places gender at the center of inquiry (Hesse-Biber, 2014). The reality of the "white male researcher" trope has, over the course of Western settler history, produced an androcentric, Western-centered research methodology and findings (Hesse-Biber, 2014; Jayaratne & Stewart, 1991). Indeed, the academic sphere is sometimes considered to be a Euro-Anglo construct of power and privilege (Anzaldúa, 2009) that has been created on the foundation of colonization; for the most part, its institutions exist on stolen land (Tuhiwai Smith, 1999). Thus, while a feminist epistemological standpoint recognizes and seeks to address the fact that the majority of knowledge production has not come from those who are marginalized (Code, 2014), giving a voice to these individuals may never be possible if the roots of this process lie in the soil of land that was taken by force and through violence. While I am without an answer to this dilemma, one must ponder the ethics of any research coming from academia, while at the

same time prioritizing the larger aims of feminist research to produce knowledge that can enact social change (Gatenby & Humphries, 2000).

With that said, what constitutes a feminist research project is frequently up for debate within the academic sphere. Some previous literature has concluded that quantitative research methods are derived from a positivist perspective and embody traditional, masculine values, whereas qualitative research methods emanate from social constructionist roots and represent feminist research principles (Mason, 1997; Oakley, 1998). Ultimately, however, there is no distinctive feminist research method, and rather feminist research is an *approach* to research design and execution (Harding, 1987; Oakley, 1998; Mason, 1997). Consequently, conducting a feminist research project involves an investigation into the choices and execution of research methods and their effects on participants and potential social change (Gatenby & Humphries, 2000).

My research employs a qualitative approach to data collection; it focuses on unique personal experiences as they have been articulated by participants themselves. In so doing, this project promotes a participatory approach to research; qualitative studies privilege the voices and experiences of participants, allowing for knowledge production in tandem with them (Gatenby & Humphries, 2000). Involving participants in the research process can help to mitigate issues such as damaging power dynamics between the researcher and participant, misinterpretation, and can even help to detect subtleties within responses (e.g., through body language, tone of voice). Further, feminist research constitutes doing research *for* women as opposed to *on* them (Mason, 1997); in order to provide support to a marginalized group, it is imperative to give those from that group the opportunity to contribute (Gatenby & Humphries, 2000).

Indeed, the existing literature on gender representation in STEM primarily employs a qualitative research approach. For example, Holth's (2014) research on working engineers has

employed interview-based data collection, revealing how women's underrepresentation in STEM fields is linked to the association of expected masculinity with technological skills. As other examples, Powell, Dainty and Bagilhole (2012) focused on gender stereotyping among engineering students using a mixed method approach that included interviews, while studies such as those by Bastalich and colleagues (2007), Powell, Bagilhole and Dainty (2009), and Gale (1994) that interrogate the engineering environment's treatment of femininity and the reproduction of its masculine culture, demonstrate the value that can come from purely qualitative research.

Semi-Structured Interviews

Within this research project, I did not have a clear or certain idea of what my participants would choose to share with me. While the existing literature in this subject area informed my research questions, the nature of investigating women's experiences is such that I was prepared to allow my research to direct itself. Semi-structured interviews allowed participants to guide the conversation as they saw fit, with a common set of questions that could allow for comparison between interviews in order to detect patterns or themes. Given that my research focuses on issues that could be subtle, covert, or undetectable to outsiders (such as emotions and microaggressions), semi-structured interviews allowed participants to describe their experiences in detail, discussing their own perceptions of people, events, and situations. By privileging the voices of my participants and allowing them to speak about what they chose, I was able to dive deeply into what they determined were important issues in their lives, while also letting the conversation progress naturally. While this approach can of course lead to participants derailing the conversation from the original intent of research, it is often in these cases that one is able to learn the most valuable insights. Thus, semi-structured interviews provided the optimal method for my participants to be the subjects as well as the knowledge producers in a research project

that aims to help them. Finally, providing participants with a space to safely and confidentially discuss potential grievances, fears, or concerns, could constitute providing them with a cathartic experience. Often, the opportunity to explain frustrations to an outsider can ease distress and leave an individual feeling less burdened; a study by Hayfield and Huxley (2015) found that women participating in interview-based research expressed their appreciation with the opportunity to share their experiences with a researcher, talk about issues affecting them, and be heard. Semi-structured interviews were chosen with this in mind; this project aims to ultimately help women in engineering, and I considered the method of data collection itself, as a potential form of support.

Importantly, as I recognized the possibility that I may encounter participants who had normalized instances of gender discrimination within their program (Bastalich et al., 2007), and/or who had assimilated to the masculinized culture, I formulated interview questions with an understanding that participants may be experiencing gendered (mis)treatment without conscious realization. I created questions that sought answers from participants in a subtle manner, allowing for potential denial, resistance, admission, or disclosure of discriminatory practice.

Participant Recruitment Strategy

I recruited participants primarily via social media and with the help of a personal friend. My recruitment poster (Appendix A) provided preliminary details of the study to would-be participants and included mention of the incentive to participate: a $15 Starbucks gift card as well as refreshments during the interview. I uploaded the poster to social media platforms such as Facebook and Instagram, and it was subsequently "shared" by my social media connections in order to extend the reach of the advertisement. The aforementioned personal friend – an alumni of the focal university's Engineering program – also shared the advertisement in closed groups on Facebook to which only Engineering students have access (i.e. Flightsuits); on-campus

engineering groups at this university have a large online presence, and these groups reach a major portion of engineering students at the school. I did not know any participants personally, but many were recruited through the shared post from my social media page. For ethical reasons (i.e., conflict of interest and breach of confidentiality), had a potential participant been known to me personally, she would not have been included in the study. I also (with permission and direction from the Engineering Society), pinned printed posters onto the university's engineering board in one of the engineering buildings on campus.

All potential participants who were interested in taking part in the study were instructed to email my Carleton account. I responded to email requests for more information about this project from all interested individuals up until the time when the desired sample size was achieved. My email response provided a more detailed explanation of the study, assurance that the study was completely voluntary and anonymous, and emphasized that the participant could withdraw from the study without consequence for up to two weeks after the interview was conducted. Potential participants were also asked to provide their availability to schedule interviews accordingly and at their convenience. Twenty-two individuals expressed initial interest in participating. Sixteen individuals subsequently replied with their availability, all of which were scheduled and interviewed.

Participants

Participants (see Appendix B) were students from an Ontario university's engineering faculty, reflecting the intended demographic of this research. Participants were over the age of 18 (and could thus provide informed consent), under the age of 25, and could be enrolled in any stream of Engineering at the chosen university. Only English-speaking students were recruited. As this feminist research project rejects a biological determinist perspective of sex and gender, and recognizes the social construction of gender and its self-determination, the participation of

female students (i.e. any student that self-identifies as female) was sought. To this end, the recruitment poster for this project emphasized the pursuit of students "identifying as women" in order to express that this research project was safe for trans individuals, and also to allow for the opportunity to gain valuable insights from trans engineering students.

Participants were required to be in their second to fifth year of undergraduate study. The decision to exclude first year engineering students was made given that interviews were conducted early in the Fall semester, and students in their first year may not have had adequate exposure to key environmental and social dynamics of concern.

Conducting Interviews

The interviews were conducted in private, on-campus meeting rooms. After being presented with and signing the information and consent letter upon arrival (which contained a detailed statement explaining the research, information pertaining to participant rights, and assurance of confidentiality and anonymity / how this would be accomplished), the formal interview began. Interviews were approximately forty minutes in length. Interviews focused on subjects' perceptions of gender within their engineering program, and the extent to which they felt excluded, devalued, objectified, or otherwise "othered" given their experiences in this realm. Questioning focused on multiple broad areas. The interview guide is presented in Appendix C. The interviews opened with demographic questioning (e.g., age, area of specialization, year of study) in order to collect some key information about the participant, and to encourage natural conversation. Next, questions focused on participants' expectations of the engineering school environment, their frosh week experiences, and classroom dynamics. Following this, women's perceptions of the phrase "being one of the boys" were explored, specifically focusing on whether this statement was one they related to. The final area of inquiry focused on participants' perceptions of the field of engineering and their place within it. In each of these areas, the goal

was to gain insight into how the dynamics revealed may relate to participants' self-perceptions and engineering-related attitudes and aspirations. All participants were properly debriefed at the end of the interview (see Appendix D). Moreover, as part of the debriefing process, efforts were taken to mitigate any risks associated with the discussion of sensitive topics by providing participants with a list of on- and off-campus resources that could be used should they need further support.

Coding and Data Analysis

Data collection and analysis for this project was based on four crucial steps: collecting and recording the data, organizing the data, connecting and coding the data, and authenticating and representing the findings (Schutt, 2009). Interview data were collected via audio-recording with participants' permission. I also took copious notes on key things participants said, issues and comments that I may want to follow-up on, as well as observations of body language and tone. After each interview I transcribed the audio recordings verbatim, assigned pseudonyms, and combined these with notes and personal reflections. I completed transcriptions of interviews while conducting others. As I transcribed my interviews, I identified key themes and issues that came up frequently. I collected themes and findings that implied trends and coded my data through NVivo software. Using NVivo, I was able to search for the frequency of words and phrases and group similar quotes and sections from my interviews together. In doing this, I was able to analyze patterns of responses, trends in answers and perceptions, and juxtapose responses against each other to help me understand my data. By transcribing interviews myself, I became intimately familiar with my data. I continually revisited and reviewed themes, at times reconfigured questions to garner additional insights or clarification in subsequent interviews, and ultimately, was able to group patterns that I may not have otherwise discovered had I been disconnected from the data (Lacey & Luff, 2007).

Insider/Outsider Debates

As I began to generate interview questions and analyze how I presented myself to my participants, I wondered whether I would be considered an "insider" or an "outsider" within my research project. On the one hand, my participants may have viewed me as a confidant and believed that they could divulge gender issues to me, as I have likely faced gender inequality myself – as a woman. To my participants, my potential insider status could also have come from my disclosure of my past work experience in an engineering firm, placing myself as an "insider" in the field of engineering as opposed to an "outsider" interrogating their community. At the same time, my insider status may have resulted in participants being *more* reluctant to divulge negative feelings towards other students in their program, perceiving me as part of the group (i.e. engineers) that they were negatively discussing.

On the other hand, I determined the ways in which I was an "outsider", including the fact that I am not an engineering student or a practicing engineer, and I am not within the social sphere of the undergraduate engineering community. Once again, my "outsider" status may have provided benefits and trade-offs; being an outsider may have encouraged disclosure from my participants had they perceived my inquiry would not be repeated to their inner circle. Alternatively, being an "outsider" may have stifled the willingness of participants to share their innermost feelings to someone who has not lived what they have. Adding to this complexity, due to social norms and embedded racism in Canada (and many other locations globally), my whiteness likely caused some participants to more (or less) readily trust me (McIntosh, 1990) and provide me with more (or less) candid answers; the social location of participants themselves affected how they saw me (insider or outsider), how they reacted to my questions, and ultimately how they answered and what they disclosed. For example, if a participant wanted to express a racialized interaction or incident, they may have felt that they could not trust a white woman with said experience –

someone who likely has never personally experienced racism. Acker (2000) proposes that the insider/outsider debate can never be completely resolved – and now I see why; my insider/outsider status was ever-changing. Thus, I was cautious with respect to self-presentation, not wanting participants to perceive me as a threat to their inner circle (engineers in general, or the university's engineering community). In order to access the answers I was seeking, my demeanor had to be non-threatening, non-assertive and curious, as opposed to interrogatory.

Social Location

Conducting research on a demographic minority from an academic position constitutes "studying down" (Nagar & Geiger, 2007). Studying down refers to studying individuals who are considered to be marginalized, from a position of privilege (Nagar & Geiger, 2007). As the researcher, my position of power over my participants means that I hold the ability to misrepresent them, or to include something they could have wanted excluded. Throughout this project, I practiced reflexivity - the act of self-questioning of knowledge production and research practice - in order to mitigate these effects on the research and avoid misrepresentation of participants and their stories (Reid, Greaves & Kirby, 2017). For example, I took notes on my experiences throughout the interviewing process, identifying my potential biases and any difficulties I faced throughout. Further, I frequently debriefed with my supervisor post-interview to discuss and unpack the experiences. These reflexive practices helped to mitigate the disconnect between researcher and participant, as they gave me the opportunity to question my own composure and perceptions and how they may affect my research process. Conducting a reflexive project can help a researcher design and execute a study in the most ethical manner possible.

Further, my social location as a woman – and a woman who has previously worked in engineering - likely affected how I interpreted results and responses from my participants. As a

woman who has experienced the gender inequality of an engineering environment, it is probable

that I sought out the behaviour and dynamics that I expected to find. I may have privileged the

female perspective and the female standpoint in my research because I can relate to it –

potentially affecting my ability to critically analyze the experiences presented to me by my

participants and recognize that the men involved in anecdotes and recounts did not have the

opportunity to express their perspectives (Acker, 2000). Because of this, I could be more likely

to find the answers I was looking for, or more accurately, interpret responses in a way that

confirms my biased expectations. Practicing reflexivity in my research, again, helped me to

avoid gross misinterpretation or misrepresentation; I continually analyzed my own

interpretations in order to maintain my awareness of my relationship to my study (Craene, 2017).

Chapter 4 Outnumbered

And it's a bit weird. I was kind of shocked when I like walked into a few of my classes in first year and I noticed that like, yeah, maybe like only 20 or 30 percent are girls!…   Corrine

Men continue to dominate engineering spheres, as women's representation has not grown significantly over time (Leslie et al., 1998; ONWiE, n.d.a; ONWiE, n.d.b; Powell et al., 2012; "Women in Engineering", 2017). The feeling of being outnumbered seems palpable to young women in this male-dominated space, emerging as a strong theme of this research. My own experience as a woman working in the field of engineering was littered with rooms full of only men and myself. This chapter will explore the potential effects of women's numerical underrepresentation in engineering school on young women's perceptions of the field, focusing on the palpable recognition of a lack of female representation at multiple levels of the institution and the socializing role this plays. This chapter will link findings with relevant theoretical perspectives and the overarching research question of this thesis, while deconstructing and analyzing relevant participant responses within this study.

Upon entering an organization, newcomers experience the effects of organizational socialization (Schein, 1988). As outlined in Chapter 2, the feelings of anxiety associated with the unfamiliarity of a new environment, prompt newcomers to try to ascertain information about their role and the expectations of them in that space (Bauer et al., 2007; Schein, 1988). One particular type of information that newcomers seek are referent cues – signals that communicate what is needed to function on the job or in the role (Bauer et al., 2007). These cues in turn, help individuals understand how they will fit into said environment – or not (Bauer et al., 2007).

Group memberships are also foundational to one's sense of self and belonging within a new space, and can help people make sense of their environments (Tajfel, 1979; Luhtanen & Crocker, 1992). Social identity theory demonstrates how the groups to which one belongs, shape

one's self- and other-perceptions, and ultimately one's behaviours (Luhtanen & Crocker, 1992; Tajfel & Turner, 1986). Importantly, individuals entering a new organization who receive referent information which signals their *in*compatibility with important social groups, may in turn experience social identity threat: a psychologically stressful state that occurs when people recognize they may be devalued in a setting because of a particular identity they hold, or that they do not belong in a group that one associates oneself with (or intends to) (Abrams & Hogg, 1999; Tajfel & Turner, 1986; Murphy et al., 2007).

At the same time, organizational newcomers can learn a great deal from those in positions of power within their organization (Van Maanen, 1978) – and it is here asserted from *who* those within these powerful positions are. Otherwise known as serial socialization, more senior members of an organization routinely impart knowledge about that space upon new members, ultimately helping to shape newcomers' beliefs about the self, the environment (Van Maanen, 1978), and arguably their place within it.

Many women interviewed in this study expressed both a feeling of being outnumbered by their male peers, as well as an awareness of the lack of female professors in their department. It is here put forward that the numeric underrepresentation of women in this university's engineering's faculty – both in the case of students and professors -- may serve as a powerful and palpable referent cue to women in engineering school, signalling to them a critical criterion of success in the field. More specifically, representing a vehicle of socialization, the numerical representation of men versus women in this academic environment may communicate the desirability – if not necessity – of being male and/or having male traits, to the enactment of the engineering role. As newcomers must learn about *performance proficiencies* (i.e., the skills, knowledge and abilities required for the job) within the organizational environment (Chao et al., 1994), their incongruence with this social group (i.e. men) may by extension, signal their

incongruence with the capabilities of an engineer. At the same time, numerical representation may also serve as a vehicle of socialization by highlighting for women the *politics* of this space (Chao et al., 1994) – the abundance of male compared to female bodies palpably showcases the power structures and hierarchies embedded in the environment. Together, the numerical representation of men versus women in the engineering school environment may ultimately impact the future career trajectories of young women enrolled in engineering school, sending signals that their identity as women is incongruent with their would-be engineer identity.

Outnumbered: Peers

Women's distinct underrepresentation in engineering school is evident from the moment that they arrive in their first year. Women represent just 21% of engineering students in Canada (ONWiE, n.d.a), and at the university of concern, only 16% of registered engineering students identify as women (OIRP, 2017). Young women headed towards male-dominated careers may already be aware of their minority status within these spaces (Brown & Leaper, 2010). Various participants interviewed confirmed this anticipation, expressing their pre-university expectations of low numbers of women enrolled in their program. I asked Tanya what her expectations of engineering school were with regards to the environment and her peers.

> *Umm …I kind of knew going into it that there weren't many girls just*
> *based off like my graduating class at my high school – there was like*
> *maybe 10 of us going into engineering and 7 of them were guys, so I was*
> *like okay that's probably about an appropriate ratio.   Tanya*

Krysta expressed a similar sentiment, indicating that she sought out information on gender and engineering prior to beginning her degree. Krysta explained that word-of-mouth and personal research prepared her for the potential realities of the engineering school environment.

I did a lot of Googling and stuff on the subject and looked up like [this university's] statistics. Like the amount of males in all of the engineering classes very much outweighs the females. So that was definitely one thing I heard a lot from people, and like when I-I talked to [people] about it they're like "oh that just sounds like a really hard program" and all this stuff – but yeah I was just kinda like -that's just what I wanna do so…Krysta

Erica was also aware of the gender disparity from pre-university experiences.

… I heard that there's not that many girls… and uh yeah…. Kind of noticed everything that I was told by engineering in high school. It's like exactly what it is …yeah…Ummm so like I went to a couple like engineering confere – well not conferences but like workshops I guess, and there's only like, you know like 10 girls per 100 guys, and I'm like yeah I see that…Erica

Gwynne reiterated these sentiments about ratios.

I thought it'd be kind of like a bro-fest – like it'd just be a bunch of guys and then there'd just be me. Just from the way that people talk about engineering…Gwynne

While some participants indeed expressed having prior knowledge of the male-to-female ratio in engineering school, many still conveyed awe at the palpability of being outnumbered when face-to-face with classmates or when in a room full of engineering students. Representing the disturbing realization of their minority status as women, Corrine notes:

…I was kind of shocked when I like, walked into a few of my classes in first year and I noticed that like, yeah, maybe like only 20 or 30 percent are girls! Corrine

Concrete numbers mark a distinct disparity between women's and men's representation in engineering, manifesting in a *feeling* of being outnumbered for young women, ultimately

signalling that they do not belong. Alicia explained that regardless of societal beliefs or gender issues, gender ratios and being vastly outnumbered is symbolic, and sends a message to young women in this space.

> *…I was the only woman engineer… even that number discrepancy still sends a message…..Alicia*

Perception of one's gender minority status in engineering could negatively affect the commitment of these women to engineering as a career path. Indeed, women who enter into an environment in which they feel outnumbered can immediately experience stereotype threat – when one fears being judged in terms of a group-based stereotype and subsequently performs poorly (Steele, 1997; Steele & Aronson, 1995). For example, in a study of undergraduates majoring in MSE (math, science, or engineering), Murphy et al. (2007) found that female students who watched videos of a visibly male-dominated conference experienced reduced feelings of belonging and interest in participating. This study proposed that women faced with a gender-unbalanced situation may experience a threat to their social identity, fearing negative treatment in the space as a result of their gender. Further, Inzlicht and Ben-Zeev (2000) compared women's performance on a math test when in the presence of either two people of the same sex, or two of the opposite sex. They found that women's performance declined significantly with the presence of two men; an environment that activates the threatening effects of gender stereotypes (Inzlicht & Ben-Zeev, 2000).

That their numeric underrepresentation is threatening and contributes to self- and/or other- perceptions of them being unqualified for engineering, was confirmed by a number of women in my study. For instance, when I asked Corrine whether she found her male colleagues

more confident than her female colleagues, she attributed male engineering students' higher self-efficacy to the ratio of men and women in the classroom.

> *…Maybe it's just like their umm environment right? ….So, I know I'm a bit less confident uhh…. In a class that's like, you know, 70% guys and 30% girls…. Or even less percent girls. But for [males] it's like 'everyone around me is kind of just like me.' So, it's easier for them to be confident in class and like in projects and everything……Corrine*

Melinda provided a similar view. Her perception of the underrepresentation of women in engineering school was that it could relate to the expression of confidence. From her perspective, it was easy for men to be more confident as they outnumber women.

> *…Just generally in engineering like it's just more fun and easier for them. Just because there…ugh… there are so many of them…….Melinda*

Moreover, another participant connected the lack of women in engineering directly to classroom dynamics. I asked Meredith if she felt that she was given the opportunity to voice her comments and questions in class.

> *A little bit… I think it's very dependent on the professor or the amount of females in the class…Meredith*

That unbalanced gender ratios are connected to confidence is concerning. The experiences of these women suggest that being outnumbered restricts their behaviour in ways that may compromise not only their learning opportunities, but so too, how integrated they become within their programs. Failure to see others who are "like them" in the environment, may lead these women to question if they "have what it takes" to succeed. As a powerful referent cue (Bauer et al., 2007), their numerical underrepresentation signals that by virtue of their gender,

they may be missing key characteristics or skills required for the job. Self-doubt and diminished confidence seem to be the result of this socialization. Not only is the field of engineering socially constructed as masculine, but the messages that women receive as they enter engineering school – as here argued at times coming from their numerical underrepresentation – reinforce this categorization (Bastalich et al., 2007), and signal to women that they do not fit in.

Importantly, however, not only is there a significant underrepresentation of female students in engineering school, there is a remarkable lack of female professors in engineering.

Outnumbered: Professors

Women continue to be underrepresented in leadership positions in virtually all fields (Barling, 2014; Oakley, 2000) - an issue that has been attributed to many different factors including exclusionary corporate culture, the association of leadership with expected masculinity, and the masculine construction of workplaces (Hoobler et al., 2011). The situation does not look much different in STEM fields, as women report frustration with advancement in this area (Mavriplis et al., 2010). Indeed, the focal university of this research currently "boasts" approximately 13% female-presenting faculty in the department of engineering (Our Experts, n.d.). Thus, women's underrepresentation in engineering school is not only seen among students, but also among professors.

Importantly, however, from the beginning of one's university career, role models – or a lack thereof – can impact student well-being, engagement, and retention. Speizer (1981) explains that female undergraduate students in general, are more likely to major in departments that employ a larger number of female faculty members, while in STEM fields specifically, female role models can help mitigate the negative effects of gender stereotypes on female students' academic performance and self-perceptions (Drury et al., 2011; Marx & Roman, 2002). Female role models are also important to female students as they represent professionals who have overcome

gendered barriers in these areas – barriers that young female students may currently be facing themselves (Marx & Roman, 2002). In fact, female role models who openly discuss the issues they faced as women in STEM, can spur female students' improved academic performance (Herrman et al., 2016).

Historically, women have been socialized into careers that are more "feminine". Gender socialization theory (Chapter 2) explains that socialization affects individuals throughout their lives, and that women are typically socialized into pursuing career paths that are in line with their gender identity (Carter, 2014). Engineering is a particularly masculine space and a career in engineering is therefore designed for men (Lester, 2008) – something that is here argued as reinforced by organizational socialization and signalled by the lack of female professors. Role models may be an important part of the socialization that engineering students experience throughout their university schooling, sending palpable signals of the requirements of – and by extension one's fit within – this space. Again serving as referent cues, the numerical underrepresentation of female *professors* sends students the clear, visual message that men belong in this space, and women do not. Moreover, with so few women occupying positions of authority, their underrepresentation in this capacity may also signal the lack of formal power that females have in this environment (i.e. also communicating the politics of this space; Chao et al., 1994).

Many young women expressed a frustration or disappointment with the lack of female professors in their department. This caused some participants to feel that they were not represented in this profession. As role models and authority figures can help young people envision themselves in a career or lifestyle, women engineering students who lack these role models may see their desired career pursuits as a potential dead end.

To investigate the lack of female role models in engineering school, I asked Priya how many female professors she has had in her degree.

> *Umm I have had three…Uh or… three engineering professors. And... one [professor] two… so… that is…. that's not a lot…. um so I guess its 4 engineering classes because one taught me two classes……….Priya*

I asked her if this was over the course of her 5 years of school thus far. She agreed, and I asked her how this made her feel.

> *It's evident that there is not a lot of representation, umm and… I mean I don't normally think of it too much. Like it's not -- I mean if they're gonna teach they're gonna teach. I guess some of the female teachers ….they've been a lot better though…. umm cuz…. I think they almost care more? Or something? But they're also younger - the teachers that are female. Which I guess is just cuz like a lot of aerospace …..uh….. its very old white men. Haha! If you look at the posters it's like 'oh yes.' Haha…….Priya*

Within engineering school, young engineering students can look at professors, teaching assistants, and guest lecturers as senior members of a field that they may pursue in the future. For many young women studying engineering at this university, looking to authority figures as role models may thus bring about various concerns and further feelings of exclusion. As mentioned above, female role models can help women in early career socialization (Gibson, 2003) and encourage women's retention in STEM fields (Herrman et al., 2016). Women in engineering school may not simply view the lack of female role models as an artifact of job shortages for women in the field, but rather, as newcomers to the engineering environment, may view this discrepancy as referent information – socializing them into a belief that they do not belong in engineering in general.

The women in this study also noted not only that there are low numbers of women professors to serve as role models, but that the ones that do exist are assigned what is perceived to be less essential curriculum to teach, compared to their male colleagues. Tanya discussed her feelings about the lack of female professors in her program, and the impact of the existing ones. Moreover, she indicated that the only female profs that she's had, have taught non-core engineering courses.

> *It's like… like not that I wanna look down on math or CCDP[3] profs but like… I don't find those particularly relevant. I understand they're courses I have to take, but they're not courses that I like, look back on and be like, "oh that was you know, really important to my degree!" So, like…. that kinda sucks because it would be cool to, you know, have a female prof. And I think there are a couple of upper year enviro female profs…*
>
> *But like it's something that you get used to and it's something that you don't really think about because it just is the reality of what it is…Tanya*

Patricia described another course taught by a female professor: a computer course that most engineering students fail to see the importance of taking. She then continued to describe the third and final example she had:

> *…And then the other one was my heritage course. So Arch-Eng is split - it's uhh conservation and sustainability. So, people either are there because they really like green buildings and new buildings, or they really like heritage… and so my female heritage professor um… I found a lot of people complained about her just because…. I don't think it's necessarily her, but it's just like the interest. They're not interested in that course.*

---

[3] Communication Courses for Disciplines and Professions

> *So yeah, I just feel like [female professors] are not as well-respected…. and it*
> *might be because of what they're teaching. But I feel like it also might have*
> *something to do with just them being a female …and… their information is not*
> *as valid or something. ….Patricia*

Other young women seeking female role models similarly expressed disappointment that available female professors were often seen teaching courses that were not engineering-specific. Almost every participant mentioned their communications class and that a female professor instructed it; this class is mandatory in this university's engineering program, though it represents a traditionally feminine skill. As noted above, the construction of masculinity is in opposition to femininity (Sang et al., 2014; Powell, Bagilhole & Dainty, 2009). As such, the presence of women in this sphere may manifest itself through being "othered" in various ways, such as being assigned non-technical or non-core courses, placing women who do work in this space into more feminine roles. Students may see their place in this field as similarly stationed; they may be denied more technical opportunities or core-engineering functions, and instead forced into more "feminine-friendly" roles in the industry (for example, communication or human resources). As such, women are socialized to understand both that they do they not belong in this space given their lacking (masculine) skills and characteristics, and should they persist nonetheless, will be relegated to more feminine (and in many cases, less powerful) roles.

Further, the lack of female role models more generally, and those representing technical or core engineering classes specifically, may contribute to the construction of social identity for young women in engineering school. More specifically, for these newcomers, the lack of women at multiple levels of the organization (i.e. students and professors) may signal to them that this "in-group" (Tajfel, 1974) to which they aspire (i.e. "engineers") consists only (or mainly) of men, necessarily casting them as members of the "out-group" within this space by virtue of their gender. Group membership is defined in opposition to other groups, and individuals belonging to

one group will exaggerate similarities with others in the same group, while exaggerating differences between their group and other groups (Lyons & Schweitzer, 2016). Thus, faced with a staggering number of men and few women, female engineering students may not only associate with their gender group, but exaggerate the similarities within said group and exaggerate the differences between women and those who are accepted as engineers: men. Moreover – and particularly powerful given this study – individuals will view themselves in terms of the social identity that is the most stigmatized in their current environment (Murphy et al., 2007). Therefore, young women may associate more strongly with their gender upon entering an engineering environment in which they feel vastly outnumbered. Problematically, as one's social identity is connected to one's self-esteem, the lack of value attributed to the female gender through the dynamics above, may ultimately wreak havoc on one's self-perceptions (Luhtanen & Crocker, 1992).

Not only were female engineering professors found to represent less technical and important aspects of engineering – ultimately reproducing embedded gender stereotypes – existing female role models are at times being treated in a manner that caused some participants to feel uncomfortable. One young woman described her male colleagues referring to a female professor in a derogatory way.

> *It's so easy to remember when you've had a female prof because I think I've had maybe like two or three in my three years or two years so far .....One was for this physics class and I think what my friend overheard is um... she might have made a mistake on the board - the professor - and then the guys behind her they were like "of course she made a mistake she's a dumb bitch" ... something like that... Corrine*

That female authority figures would be treated in such a way is supported by the construction of masculinity as superior to femininity, and the incongruency of femininity with technical skills (as mentioned above). It is possible that women in positions of authority in this masculine, technical space could be met with defiance or rejection, as a way to protect and reinforce the construction of this space as masculine (West & Zimmerman, 1987; Lester, 2008). Indeed, a study by Javidan et al. (1995) found that men are far less likely to accept female compared to male superiors as role models. In essence, women who defy the socially constructed (traditionally masculine) engineer identity, could face discrimination and mistreatment.

Importantly, however, for many young women, seeing the way that women in their field are treated by classmates could spark concerns about how *they* will be treated in the future. Patricia's concerns also surrounded the treatment of female role models in her program, and particularly the lack of respect that female compared to male professors in the department received. Such a noted discrepancy suggests that women may be receiving important messages about the power (or lack thereof) (Chao et al., 1994) of professional female engineers: not only do a very limited number of women have power in this environment, but the one's that do, have their authority undermined and questioned via their mistreatment. I asked Patricia initially whether she had female professors and how she felt about the lack of women in the engineering school faculty.

> *I have had a few. I find that they're not as well-respected as male profess-*
> *professors are umm... maybe it's just cuz… Okay I've had -- let me think. I*
> *think I've had three or four female professors over my two and a half years of*
> *school and they just…. I feel like people don't look at them as highly. And it*
> *might be because the courses they're teaching aren't as interesting. For*
> *example, like the female ones I've had were CCDP which is the written class.*
> *Patricia*

I also asked Denise how she felt about the lack of female professors in her program.

I didn't- it wasn't something I noticed until it was brought up to me. Until someone actively mentioned it going 'how many of your profs have been women?', and I had to think and realized 'oh wait not that many!' But…while in the course it didn't matter a lot to me, but I feel that if more of my profs were women it would have been a little more encouraging to me because.. I mean engineering has that big reputation of being very difficult in the beginning right?

…And to see the profs who have obviously succeeded in their careers and to have most – only one of them be an actual um engineer who was a woman, it was a – I guess a little disheartening thinking back on it that like – wow. We don't ….there aren't that many visible to us…….Denise

Denise believed that it would be more encouraging for female students to have more female professors represented in her faculty. The desire was reiterated by Meredith. In a conversation about the number of female professors in her program, this woman expressed that she finds it easier to speak and ask questions to a female professor or teaching assistant than one who is male. I asked her why she thinks that is, and why she finds it harder to speak to male authority figures in her program.

Ummm… I don't want to say it's an intimidation factor… but I think that instead of asking questions… um… a lot of us [women] would rather just like, ask our peers who are way less judgmental than if we asked questions to a prof or a TA. We don't want them to think lesser of us because we're asking questions …….Meredith

Thus, female students are not only receiving the message that women are not adequately represented in engineering, but that those who do work in this space receive disrespect or represent the non-core aspects of engineering academia. Combined, these messages tell women

that they do not belong, do not have the skills needed to succeed, and that if they continue to pursue this career path nonetheless, could face the same mistreatment – and lack of power – as their female professors.

Conclusion

The underrepresentation of female peers and authority figures within the university's engineering department may ultimately be shaping the understandings of young women entering this field when it comes to what is needed to succeed in this industry, and how much power one may have should they pursue such a career. The impact of being outnumbered may be affecting women's desire to remain in engineering, given how these ratios can shape self-perceptions of belonging (or isolation), and ultimately, perceptions of (in)congruency with the engineering environment. As a palpable referent cue, the underrepresentation of women at multiple levels of the organization serves as a powerful vehicle of socialization, highlighting the incongruence of women in this space, and demonstrating the role and status of the women who persist in the field regardless. Engineering school, the socialization ground for future engineers, immediately demonstrates to women that they do not belong.

Chapter 5 Nobody's Laughing: Humour and Objectification

I feel…I'm visible and everyone can see. Everyone knows I'm like the only one here…Corrine

…I was like 'everyone else here was joking, but you can just tell the way that you said that-that your intention was out of spite rather than as a joke'…Priya

Women who occupy masculine spaces can experience a variety of messages, both clear and covert, that they do not belong. As discussed in Chapter 4, spaces in which men outnumber women can cause women to feel marginalized, isolated, and ultimately, that they do not fit into the environment. What's more, this numerical underrepresentation serves as a palpable referent cue (Bauer et al., 2007) for female newcomers, signalling that they lack key criteria to function in the field, as well as highlighting the lack of power they hold in that space (Chao et al., 1994). However, as revealed through my discussions with many women, this setting is one that can also translate into a *feeling*; a feeling characterized by being watched, by being singled out, or by being sexualized. This chapter will explore more deeply the repercussions of this feeling experienced by numerous women in my study, and the socializing role that this fostered sentiment plays for women in this environment. More specifically, this chapter will explore the construction of women as presented for male consumption and objectification, as well as instances of sexism and mistreatment hidden behind seemingly harmless or normalized interactions with male colleagues. Together, it is asserted that these dynamics constitute strong relational cues – messages pertaining to how one relates to and should interact with others around them (Bauer et al., 2007). These interactions, the associated feelings generated from them, and the normalization of the culture they create (and are created by), may socialize women in ways that may ultimately encourage their withdrawal from the engineering environment altogether.

As articulated previously, the process of socialization into a new environment involves the integration of an individual into a new culture, with new peers and new expectations. During this time, newcomers seek out and are exposed to various kinds of information, ultimately contributing to their learning of that space. In particular, coming to understand *people* (i.e., the creation and fostering of relationships with one's peers, one's social acceptance) *and politics* (i.e., power structures, hierarchies, and how to navigate the social structure of the environment) are critical to a newcomer's integration in the environment (Chao et al., 1994; Chao, 2012). Women entering engineering school are thus absorbing information reflecting both of these socialization content areas, and using it to make sense of their relationships, their role, and their surroundings. Importantly, such information can be communicated through various channels, among the most palpable, one's peers (Saks & Ashforth, 1997). In fact, newcomers often report organizational insiders such as peers to be more useful sources of knowledge about the environment than formal training or orientation programs (Louis et al., 1983, Nelson & Quick, 1991). Extending from this, the socialization process is often one that is quite informal in nature; daily interactions, conversations and implicit or explicit exchanges provide opportunities to learn much about a space (Cooper-Thomas & Anderson, 2006; Ostroff & Kozlowski, 1992).

Many women in this study explained how the interpersonal dynamics of the environment made them feel uncomfortable. More specifically, various young women interviewed explained that they felt watched or singled-out by their male peers. As revealed below, this feeling may reflect larger issues of objectification for these women, and by extension, speak volumes to these individuals about what their relationship is to their peers (i.e. an object of consumption). Moreover, how their peers see them (i.e. as the "other") may also be inferred from these dynamics. At the same time, participants expressed their frustration with sexist jokes and teasing coming from their male colleagues. These negative interactions with peers couched as amicable

exchanges, may signal to women that their male colleagues view them as less entitled to be in engineering school, and by extension, are not socially accepted. Moreover, these interactions may reinforce structural inequalities within this space; the power structure characterized by the treatment of these young women by their classmates, is one that constructs women as inferior or as undeserving of occupying the space they are in. Not only this, but women experiencing these interactions over time, could internalize and view them as normal. Together, these interpersonal dynamics may socialize women, demonstrating to them not only their current relationship to those around them (and the [lack of] power they hold within these relationships), but what they can expect in the engineering environment in the future.

Feeling Watched

The socialization of men and women constructs each gender within specific, rigid parameters. As discussed previously, gender socialization constructs men as dominant and superior and women as submissive and inferior (Carter, 2014; Mulvey, 1999); masculinity as active and femininity as passive (Oliver, 2017). Derived from patriarchal roots, women's social construction as the submissive "other" is demonstrated in art, film and media, both historically and currently; men are constructed as the protagonist and women as the object of desire (Oliver, 2017; Mulvey, 1999). The objectification of women not only exists in popular media, but is representative of the social construction of gender more broadly. Women, both artistically and socially, are presented as objects for male scrutiny.

Mulvey (1999) coined the concept of the "male gaze" to describe the representation of women (exclusively) as men's objects of desire in art and film (Eaton, 2008). Within feminist research, this concept has been further expanded to describe the construction of the female gender. Mulvey (1999) claims that there is no space for a female spectator or consumer – a claim that Oliver (2017) modernized, augmenting to include objectifying representations of women on

the internet in porn, celebrity photos, social media, and advertisements. Oliver (2017) explains that we live in a "culture of the male gaze" wherein women are continuously represented in ways that are intended to be consumed by men. This concept most often refers to a *sexualized* gaze, representing women not only as objects, but objects of sexual desire (Eaton, 2008). Further, through social media, men can freely comment (anonymously or overtly) on photos, videos, and all online representations of women's bodies, mobilizing the effects and execution of the male gaze; women's bodies are constantly available for men's observation and judgment (Oliver, 2017).

Women's relentless sexual objectification by men is a well-known issue, but what effect does this have on women? First, women are socialized into a constant awareness of this objectified status, and a self-monitoring of how they physically present themselves (Calogero, 2004). This means that women are hyper-aware of how they look, what they do, and the things they say, leading to cautiousness about how they are perceived by others, scrutinization of their own appearance, and a second-guessing of themselves that detracts from the true purpose of their presence in a given space (Fredrickson et al., 1998). Previous research has also shown that women have been conditioned not only to anticipate objectification, but to view themselves through a sexually objectifying lens; "self-objectification" is the view that women have of themselves in light of feeling they are being watched (by men), becoming a part of their social identity and everyday experience (Calogero, 2004; Fredrickson et al., 1998).

A study by Calogero (2004) investigated the effects of anticipated objectification on female undergraduate students, by leading them to believe that they would be interacting with either a man or woman before completing a self-report measure. Participants who were anticipating a male interaction self-reported increased feelings of body shame and anxiety. These negative effects of objectification were triggered by the mere anticipation of a male gaze (Calogero,

2004). The internalization of misogyny and sexism can also lead to long-term mental health problems in women (e.g., Pavalko et al., 2003; Moradi & Funderburk, 2006; Szymanski et al., 2009), and in fact, to their performance. A study by Fredrickson et al. (1998) analyzed undergraduate women's experiences of self-objectification by randomly assigning them to try on either a swimsuit (i.e. a symbol of women's sexualization as often presented in popular media for a male audience) or a sweater (i.e. a more neutral form of attire) while completing questionnaires and a math test (Fredrickson et al., 1998). Interestingly, women who were assigned to the swimsuit condition performed significantly worse on the math test, self-reporting feelings associated with self-objectification on their assessments (Fredrickson et al., 1998). From the perspective of the current investigation, it is particularly important to note that young women's performance in this study pertained to a socially constructed masculine skill (i.e. a math test) – one that parallels the masculine nature of engineering and its curriculum.

Importantly, whereas the inducing of self-objectification can come from experiences such as wearing a swimsuit, these occurrences do not necessarily have to be body-focused to yield negative consequences. (Self)-objectification can be triggered by particular social constructs and environments (Calogero, 2004). For instance, being a minority in an environment may trigger a sense of "otherness" or visibility that generates discomfort; women in engineering work environments can feel exceptionally visible due to their gender identity, even experiencing unwanted romantic advances from colleagues (Faulkner, 2009).

Participants in this study overwhelmingly described to me a "feeling" - a feeling that, at times, felt like sexism but was difficult to pin down.

> *It's there! But when people are like "please explain" you can't really explain it…Patricia*

> *So, it wasn't something I could really pin down as to go "oh it's just because I'm a girl" right? Because I'd rather not make those assumptions. But there definitely were times where I was like uuhhhhhh …Denise*

These young women expressed various levels of discomfort and uneasiness. Many young women expressed feeling watched by their peers or feeling more visible in the engineering environment than in other spaces.

I asked Corrine about her experiences and feelings in classrooms in which she was one of very few women (or the only woman).

> *I feel…I'm visible and everyone can see. Everyone knows I'm like the only one here…Corrine*

Krysta also expressed her initial perception of the gender disparity and her feeling that her status as a gender minority caused her to be more visible, or more watched.

> *Well I would say, like at first…. Ummm….. like when I was in first year like…. it's kind of intimidating. Because... like…. Yeah. Just because there are so few of us like, you kind of stand out…….Krysta*

Participants not only identified the feeling of visibility and of being watched – in line with the concept of the "male gaze" – but also alluded to its effects. Corrine explained that being a woman in this space causes her to think about every decision she makes – including where she sits in class.

> *Even just like taking your seat and stuff like…. it's the littlest things! And I just feel like…. you know…. it's a visibility issue. I'm like – there. I'm like - highlighted…Corrine*

Corrine elaborated further, explaining that everyday actions involved a conscious understanding of her "otherness" as a woman in the environment. This represents a heightened self-awareness that occurs when one's sense of objectification is activated.

> *If I know I like had to go to the bathroom, I'd sit in the corner just so like…. I know in the center I'll have to, you know, kind of like… get out and shimmy past like 8 guys. And then I'd have to shimmy back in where I'd have to come back inside to take my seat. And just like things like that. I just don't wanna have to do that… Corrine*

Corrine's feelings of visibility and associated avoidance of certain interactions with men in her classes could reflect a perception of objectification. Further, as discussed above, it represents a woman's constant self-monitoring of how she presents herself physically. It is plausible that women in engineering are monitoring their behaviour even more intensely due to their marginalization in the engineering school environment. Instead of arriving to a classroom and focusing on school, these women may be distracted by their visibility and presentation of self in this space – something that may contribute to difficulty in achieving optimal states of motivation and performance (Fredrickson & Roberts, 1997).

Erica felt similarly visible in the classroom.

> *…I do know that people do pay attention to me because it was like, the first couple of weeks of class and like this guy just came up to me he was like "Oh you're that girl. You sit at the front. Ha! I notice you." I was like "oh okay… okay"…Erica*

I asked her how this visibility made her feel, and consistent with research, she expressed that it caused her to increase her self-monitoring.

... Well before that like, I was just doing whatever at the front. You know… like I'll eat my sandwich, I'll sit whatever…. But now, I'm like "oh crap everyone's like, looking at me from behind. I better like… sit like a normal person." Or like, you know, be aware. But people notice me, so I can't be wearing pa-pyjamas to class, kind of thing. You know?...Erica

The intense feeling of being watched, experienced by Erica resulted in heightened self-awareness and self-monitoring. She expressed that she felt uncomfortable eating and dressing in certain ways once her classmate brought to her attention that she was being watched, and potentially objectified. Corrine explained that even simple acts, like posing or answering questions in class – in a feminine voice – would bring her unwanted, gender-based attention from male peers. She expressed that this feeling also caused her to second-guess her answers and worry about her perceived proficiency in the classroom.

I just…I don't think I can afford to be wrong, you know? If you're like, in a big lecture and then like, you ask a question or you answer a question - like clearly in a woman's voice…uhh maybe like a higher pitch - like if you're just a guy sitting in class and you're like on your phone, you might just like, kind of notice. Like…. he'd like….. might just look up. Like "oh a girl's answering the question". And then if she gets it wrong, you're like…. you kind of register in your head that it's wrong. Then like every single time that happens you'll be like "okay, so clearly there's a trend here". But you might not notice it with guys as much just because it's like…. it's like the default voice. Do you know what I mean?...Corrine

Participants in this study expressed, in essence, feelings of being watched and singled out. Previous research has framed women's self-objectification as an impediment to their focus and proficiency (Fredrickson et al., 1998). The women in this study explained their sense of being watched as a conscious feeling of discomfort that affected everyday actions such as eating in

class, selecting a seat, or asking/answering questions. Women are socialized into expectations of their performance of femininity, and women performing gender in the workplace (or in this case, in school) tend to take up space more tentatively and more carefully than men due to their gender socialization (Hirst et al., 2018). As seen here, this tentativeness – amplified by feelings of objectification – can affect women's performance and focus in the workplace or at school, potentially causing an interruption in their work (Fredrickson & Roberts, 1997).

Importantly, as women are socially constructed as objects of male observation, scrutiny (Oliver, 2017) and heterosexual desire (Eaton, 2008), the "male gaze" affects women in all contexts. However, it can be inferred that experiences of objectification such as those shared by the women above, are amplified in some spaces – in this case, engineering. Given the sheer number of men versus women in this space, and that discomfort can be triggered by minority status in a given environment (Faulkner, 2009), young women in engineering school are likely experiencing amplified feelings of being watched and of being objectified.

When taken together, it is asserted that the ultimate message being communicated to women through feelings of the "male gaze", is that they are "other" in this environment – they are objects and are not equal to their male counterparts. This message is a powerful one when it comes to the relationship of women to their peers, thus serving as palpable relational information of their social acceptability. In line with social identity theory, this message is one that may lead to an understanding among women that they do not belong in the desired in-group (i.e. that of engineers), and by extension, this identity should not form part of their sense of self (Tajfel, 1979; Lyons & Schweitzer, 2016). Moreover, the experience of being singled out reinforces the *politics* of engineering school; these young women are learning that they are constructed as different than the norm in this environment and are operating within a power structure that places men as the dominant group and women as the unwelcome (and highly visible) minority.

In summary, the male gaze and the sense of being objectified could be socializing women into a certain way of conducting themselves, into an internalized misogyny with long-term consequences to well-being, and ultimately, into pursuing alternate career paths in which the objectification and feeling of being watched does not exist, and one wherein they are socially accepted.

Just Kidding

As mentioned in Chapter 2, women's presence in a masculine space can be met with resistance, manifesting in particular forms of (mis)treatment for female students in order to regulate the environment itself. In line with social identity theory, individuals will exaggerate the similarities within their associated social group, as well as exaggerate the differences between social groups (Tajfel, 1979). Applying this to the current study and the aforementioned research, men in engineering school may be reinforcing the differences between themselves (the dominant group) and women through their behaviour, and in particular, through humour. Jokes or banter with sexist undertones and /or sexualized chants couched as "fun", may be methods of reinforcing the ingroup (masculine) and the outgroup (feminine), ultimately socializing women to recognize that they do not belong. At the same time, the "othering" communicated through this behaviour reinforces a power structure that places men as superior to women in this environment. Indeed, Cortina (2008) describes gender-based incivility as acts of discrimination hidden within seemingly typical behavior (e.g., jokes, rudeness, disrespect). Given that overt discrimination within organizations is more frequently condemned in a modern Western context (Canadian Charter, 1982, s 15), forms of incivility allow discriminatory beliefs and messages to be expressed in more covert – and protected – ways; using humour as a form of gendered mistreatment constructs the perpetrator as non-threatening and the victim as "othered". Importantly, covert mistreatment of this nature is especially prevalent and significantly more

damaging in spaces wherein women carry out stereotypically masculine jobs (Parker & Griffin, 2002), and as such, may indeed be something to which women in engineering school are routinely exposed.

Participants within this study described jokes that they have heard from male colleagues that caused them discomfort. A number of women expressed that the issue with jokes is that the manner in which they are presented is considered to be in good humour, whereas the comments border on (and sometimes clearly are) offensive and sexist. The ambiguity of sexism presented in the form of jokes led several young women to wonder whether they were being targeted based on their gender or based on other factors. In fact, the ambiguity often surrounding this mistreatment is itself, arguably part of the victimization of these women, causing them to question – and even doubt – their senses and feelings. Might they be reading into things? Are they being "too sensitive"? Indeed, the shrouded nature of their gendered (mis)treatment, may present unique challenges for these women. Within this study, overt gender discrimination appears less frequently, whereas behaviour that is seen as normalized is used to mask underlying messages about gender, and women in engineering more broadly.

Priya explained a scenario in which a group of engineering students were making jokes, and one colleague in particular turned the conversation from seemingly light-hearted to comments that made her upset.

> *… Something that's kind of been happening this semester which, it's kinda*
> *happened through comments along the way, but this semester's done – I'm just*
> *fed up with it… umm but we were all just joking around and someone just*
> *made a comment "well you got co-op because of quota"…Priya*

From the perspective of this young woman, the implication of this "joke" was that she received a co-op term simply because of school- or workplace-sanctioned requirements denoting

that a certain number of women be represented in the co-op program. She went on to describe her response to this message.

> *…I was like 'everyone else here was joking, but you can just tell the way that you said that-that your intention was out of spite rather than as a joke'…Priya*

From her perspective, something that may have been intended as a joke had a more serious implication for her and her place in this context. She perceived this message as devaluing her ability and her place in this environment; this could constitute a form of social identity reinforcement by a male student attempting to underpin the differences between himself (in-group) and this woman (out-group). Moreover, this message is one that communicates to this woman how a male peer sees her: as someone who does not deserve to occupy the engineering space.

Previous research has indeed highlighted the socializing role that humour can play, assisting newcomers in making sense of their role, their peers, and their environment (e.g., Tracy, Myers & Scott, 2006). What's more, during socialization, humour can often serve to demarcate boundaries: humour can boost uniformity among insiders and further distance their relationship from a newcomer (Mak, Liu, & Deneen, 2012). In other words, these jokes further socialize women and construct them as "other".

Gwynne echoed this sentiment in her description of a "joke" aimed at her status not only as a woman, but also as a woman of colour.

> *Yeah I think there was a joke one of my guy friends made once… umm… he said something about like… "Oh, you'd be like a good person to hire. Like… you'd make the company look really good because you're a woman and you're of colour".. and he's like "It might even give you like an unfair advantage". And of course you can guess like…. He's a straight, like white cis heterosexual male…Gwynne*

The reference to her skin colour as well as her gender appears to be targeted; whereas the comment was ostensibly meant as a joke, the underlying implication is that she would be hired regardless of her actual qualifications and proficiency, given her gender and race. This interaction not only tells this young woman that others doubt her skills, but in so doing, reinforces the difference between herself and the dominant group (male engineers), and signals that she is not socially accepted.

Krysta reiterated a similar sentiment as she described a conversation with her boyfriend (also in engineering) about their upcoming graduation and job search.

> *...Like…. We're talking about job interviews and he made a comment saying*
> *"Oh well. I mean… if you just go into an interview and like undo a few buttons*
> *on your shirt they'll give you it for sure!"   Krysta*

In this context, the implication that her gender and therefore sexualized, objectified status would provide her with a job opportunity, undermines her skills and proficiency in this field. Krysta mentioned this frustrated her, and that her reaction caused a backpedal from her boyfriend that the comment was meant as a joke. The presentation of such statements as "jokes" exonerates perpetrators by claiming that the comment was amicable and all in good fun.

At the end of our interview, Paula mentioned to me off-record that she perceives certain jokes as a "shield" for real opinions. She explained why she thinks these "jokes" are so effective in hurting herself and her peers. With her permission, I added her "shield" comment to my notes and turned the recorder back on, asking her to elaborate.

> *Like…. If you make a joke about quotas, it's the exact thing that women have*
> *always dealt with and you don't realize it because… society's not telling YOU*
> *that you don't deserve to be here….. but we're hearing that loud and clear and*
> *that IS what you're saying…Paula*

Paula made a direct connection between the perception that women do not belong in engineering, and the reinforcement of the dominant group via jokes. Jokes related to the legitimacy of women's belonging target beliefs that are echoed by society and gender socialization. She continued, explaining that these "jokes" not only hurt women in this particular space, but that they can be used to question the competence of female engineers more broadly.

> *…then.. any male co-worker can sort of make that excuse for you being like "oh… well, maybe you just got hired for this reason". Any time you slip up they go "oh you know what… this is the reason". Because some people think that deep down, and then they make a joke about quotas…Paula*

By creating an "excuse" (such as diversity requirements and hiring quotas) for women's achievements in engineering, men can reinforce the notion that women do not belong. Not only can these comments encourage the questioning of women's place within this space, but they can cause women to second-guess themselves and question their deservingness, further socializing them to understand they are not wanted in – or suited for – this environment.

> *Yeah, like ….I know because I have a lot of experience and I'm very proud of everything I've got going for me, that I deserve to be here… but, we're constantly being told we're not…. And also, if every single time you get hired as a woman you think "is this why they hired me?" And you don't want that to be the reason…Paula*

Whereas jokes could be misinterpreted, some young women expressed frustration with a more explicit form of incivility: engineering songs and chants. While universities across Canada have cracked down on vulgar chants and songs during frosh week (CBC, 2014), young women involved in this study indicated that new rules surrounding orientation have simply pushed these practices to other school-sanctioned events.

In a discussion of sexist banter and chants, Tanya explained:

*Yeah so stuff like that happens a lot…. Umm… like big engineering events…
and like you know ….when we're bussing somewhere…Tanya*

Further into the discussion, she continued:

*So, I went to [an engineering event] this year and you know it's like an hour
and a half bus ride there and back or whatever…. And the whole time just these
awful, awful songs came out and I'm like "ah yes". Like I forgot what these
songs were like…Tanya*

I asked her for an example of these songs:

*Oh god. There's this one about.. like…. 'I worked at the old department store
and I don't work there no more because….' And they just come up with a
bunch of ….like….. one of them is ….you know…. 'this woman came into the
store looking for a rug, rug she looked for, shag she got'…Tanya*

Tanya explained that she would have liked to say something about her discomfort but felt
she would be met with the typical explanation that it was "just a joke" – a common scapegoat for
these forms of incivility. These overtly sexist songs and chants are multiply problematic. These
chants not only reinforce the sexualization of women, but can also activate self-objectification,
causing women significant discomfort and shaping their self-perceptions in this environment. As
newcomers to this space, women absorb information based on peer treatment. Sexist chants,
songs, and teasing can reinforce structural inequalities (i.e. masculinity is superior in engineering
and femininity does not belong) that women may come to normalize as a part of this
environment; women may believe this to be a typical part of engineering school, and its
underlying motivations a typical part of the engineering field. Further, by demonstrating that
men treat women as inferior in this space, the power structures of the environment (i.e.
patriarchy) are revealed and reinforced. Whereas these kinds of interactions between men and
women can take place in any context, it can be inferred that the vast underrepresentation of

women in this environment could amplify these experiences. Given that women are outnumbered heavily by men in an engineering school context, sexist interactions may not only happen more frequently, but could affect women in a more palpable way when combined with their awareness of their minority status.

Melinda explained that whereas there may be an *assumption* of group acceptance (i.e. as an engineer), as a young woman she felt isolated and uncomfortable in these masculine spaces. Melinda was visibly uncomfortable discussing this and expressed that her inability to speak up in instances involving sexist jokes and teasing, worsened her feelings of discomfort. This quote brings the feeling of being outnumbered together with objectification, to create a socializer that teaches women they will be subjected to sexist messaging in this space, but that they are outnumbered and thus do not have the power to speak up. I asked Melinda for an example:

> *Somebody will bring up a girl that they saw in one of their classes, and a couple of them will make some really overtly sexual and kind of objectifying comments about her….. and I'm just kinda sitting there like 'that's not something that I think she would appreciate you doing, and I don't really appreciate hearing it.' But, I don't want to be just like… yeah. Cuz in situations like that there's gonna be either the perception that you're being like… too political, or that you're doing it because you're jealous for some reason. And there's really no place where you're being taken seriously in that situation. [Pause, looks uncomfortable]…Melinda*

Not only did Melinda feel uncomfortable in this space, she felt that she was not empowered to comment or disagree. She was a part of these gendered and sexually objectifying discussions and yet believed that if she were to express her discomfort, she would not be taken seriously. What's more, previous research has found that when newcomers accept being the butt of humour from integral members, their rapport with these peers is reinforced (Mak et al., 2012). Thus, that women may in some respects feel compelled to allow this gendered mistreatment to persist in the

name of social acceptance, showcases an equally troubling force silencing some women in the face of sexist banter. However, regardless of their voiced response, these interactions undoubtedly "other" women, reinforce their sexual objectification, and ultimately, socialize an understanding of their relationship to those around them, and the type of treatment that awaits them in this field.

Conclusion

In summary, various participants in this study emphasized discomfort with gendered / sexist statements from male peers that are presented as jokes or as otherwise "normal" behavior. Some young women also expressed some ambiguity around whether such exchanges were meant as humour or as vessels for delivering deep-rooted beliefs and opinions, ultimately fostering a *feeling* or "threat in the air" that was difficult to explicitly pin down. Others expressed feeling isolated, experiencing self-doubt, and a feeling of visibility; women communicated a feeling of being watched, or of being acutely visible to their male peers. This may be causing women to engage in higher self-monitoring, leading them to constant vigilance about how they present themselves to others and may be inviting the male gaze – processes that may ultimately interfere with their ability to perform daily tasks. Together, these social interactions serve to send powerful signals to women about the people and politics of this space, socializing them to understand that their relationship to others is one of object and unequal, and, that they do not (and will not) hold power in the engineering environment. These learned understandings may very well work to discourage women from a future in this field.

Chapter 6 A Threat in the Air

…In engineering and…in classes it isn't necessarily a place that women always feel …
safe…There's been a lot of experiences that myself and others in my program have had that …
uh… kind of make it like….. a lot of the people make it feel a little unsafe…Melinda

Most skill sets associated with the field of engineering – such as technical skills and mathematics – are socially constructed as masculine, ultimately constructing the field of engineering itself, as decidedly "male" (Bastalich et al., 2007). The masculine nature of this space is also reinforced through its agents – members of the "in-group" who fit into the environment (in this case, men), and in particular, by authority figures (Block, 2012). Indeed, Connell (2005) explains that the ideal masculinity is perceived as strong, dominant, unemotional, and rational – representing skill sets such as those above that fall into the category of engineering proficiencies. Moreover, this hegemonic masculinity is rigid, leading its agents to exaggerate differences between themselves and "others", and resulting in negative treatment of these "others" (i.e. women) in this space (West & Zimmerman, 1987). Further, this masculine culture can reinforce dangerous narratives that construct men as not only superior, but dominating in this space – a narrative that may lead to discrimination, harassment or even violence, and at the very least, *fear* of such mistreatment by women in these spaces.

As previously discussed, the gendered nature of the engineering environment is reinforced by the number of men in this space (see Chapter 4), the male gaze, and sexist behaviour repackaged as jokes and teasing (see Chapter 5). By communicating important information about the proficiencies, people, and politics of this environment (Chao, 2012; Chao et al., 1994) these dynamics work to signal the unbelonging of women herein, socializing them in ways that may discourage their continued participation in the field. At the same time, during engineering school women may also be absorbing information regarding the goals and values of

the engineering profession, teaching them to recognize and absorb the broader rules and norms of this space (in particular) and industry (more broadly) (Chao et al., 1994). Importantly, however, the goals and values of this hegemonic masculine culture may be communicated in a way that fosters a palpable sense of vulnerability and risk among some women. In this chapter I will address how negative interactions with male authority figures and peers can reveal much about the power dynamics of this environment (Chao et al., 1994), and in fact, may ultimately make women feel unsafe. Moreover, as suggested by my interviews, by embedding acts of harassment and violence into the everyday activities of students, agents of socialization normalize the mistreatment of women in a way that may lead them to not just expect, but accept, their negative treatment.

The objectification of women is constant, causing women to self-monitor and cautiously behave in ways that are affected by their awareness of their physical presentation to the public. Indeed, Fredrickson and Roberts (1997) explain that women's constant self-analysis comes from a cultural perception of women as presented for a male audience (see also Chapter 5). Expanding on this self-monitoring, Fredrickson and Roberts (1997) claim that women are not only attentive to constant objectification of their bodies, but further, that women are constantly on alert for potential sexually-motivated violent crimes or harm. The socialization of men as dominant and strong, and women as subservient and weak, reinforces dangerous stereotypes that normalize violence against women – women's social construction as subservient causes an embedded inequality that can fuel the perception that men's aggression (or violence) is somehow biologically related to their gender or sex (Griffin, 1971). Women are the most common victims of violence (Price, 2005), and the normalization of men as strong, aggressive, and sexually motivated creates a narrative in which men's violence against women is not taken seriously.

Relatedly, women's entry into masculine spaces has historically been met with resistance; in a technical, masculine environment such as engineering school, women's entry into this space could represent a threat to masculinity (Schilt & Westbrook, 2009). Kimmel (2013) links threatened masculinity to a concept called "aggrieved entitlement" – a sense of privilege that is perceived to be owed and has been taken away or usurped. Kimmel (2013) explains that this feeling can be evoked by individuals who are "other" entering a space for which the dominant group feels ownership; the dominant group may experience aggrieved entitlement and blame those who are constructed as "other" for disrupting their self-benefitting systems. Subsequently, this can cause the powerful to feel anger against those who are construed as usurpers, further marginalizing marginalized groups (Kimmel, 2013). Kimmel (2013) links aggrieved entitlement to misogyny, racism, and intolerance more broadly. Further, he classifies acts of violence or hate crimes, as potential expressions of aggrieved entitlement.

A number of women in this study reported how the treatment received from male authority figures and peers made them uncomfortable, and at times, even unsafe. None, however, expressed this was shocking, nor felt that they could or should report the given incident. These young women's perceptions and reticence suggest that this conduct is normalized within this environment, and they felt it unacceptable, atypical, or problematic to counteract this negative behaviour.

Troubling Male Role Models

Various participants in this study expressed their disappointment with the lack of female role models in their program (and the roles and treatment of those that did exist) (see Chapter 4). However, some also signaled that the available *male* role models they had were not all that positive, and in fact, were responsible for behavior that made them feel anxious or unsafe. One student described an uncomfortable situation with a teaching assistant (TA) that not only

reiterated gender differences within engineering, but represented a violation of privacy and the crossing of a line that caused felt vulnerability. This student also explained her belief that the TA would likely not have acted the way he had, if the students involved had been male.

> *…What anecdotally happened is that [my female friends] had a different lab section than I was in, and then we were just in Leo's lounge talking and they're saying "oh my god there's this TA who was so rude… we were doing the geo-tech lab" – it doesn't really matter what subject it is, but they had to use like actual lab equipment. It wasn't just watching the TA do it – we actually had to do the experiment ourselves… And they were doing it and the TA is kind of like "hey girls do you need help?" And I think the tone they got was like "well you're women you can't obviously… you'll need help" sort of thing. I think that was the tone they got. And they said "no" … like kind of just leave us alone right? And … I guess he stopped talking to them, but then they noticed that he was taking his phone and taking pictures of them!*
>
> *And it's kind of how they felt – they felt really embarrassed because one, you don't ever really want pictures being taken of you without your consent… and also, like this is a laboratory what are you doing!? Right? And like he was clearly making fun of them in some way right? And so, it was just… yeah. I was really thankful that I wasn't in that group……Denise*

I asked her why she thinks her colleagues did not report the incident.

> *I think they just don't want to bother anyone and they're just kind of like "whatever it's sexism in engineering big surprise right?" That was probably like…. I think that's what….. I don't think I would've reported it either…Denise*

In this context, the male TA is a role model acting as an agent of socialization. This TA in a position of power, is using his authority in a manner that demeans the young women in his

class. He also displays behaviour that violates the privacy of female students in a way that threatens to evoke further harm (for example, were he to post these photos on social media or send them to peers coupled with derogatory or sexualized dialogue). Through his comments and behaviour, this organizational insider communicates to these women – and all others who witness this social exchange – that women are not as capable as men in the given engineering task, and moreover, that these women do not have the same right to respect as others may.

Interactions that re-confirm gender differences within formal engineering settings (such as the classroom) remind women that they may not belong in these spaces. Through his actions, this TA is emphasizing the differences between himself (a member of the in-group: male engineers) and women in his field (members of the out-group), further reinforcing the power hierarchies of the space. Moreover, this experience may signal to young women not only who is in power within this context, but further, how these power-holders use said power. By taking photos of these young women, this male authority figure is abusing his position in a targeted way – this TA exercises his power in a way that makes the women feel uncomfortable, giving them unwanted attention that he does not offer the male students. By extension, the "othering" and fostered sense of vulnerability created by his actions, may reveal important insights to these women about the larger values (i.e., masculinity) and goals (i.e. maintain a male dominated space) of the field. Absorbing this information as descriptive of the environment, women may then come to accept treatment of this nature – and feelings of vulnerability – as normal.

Another woman shared with me the experiences she had with a problematic male professor. In an overt expression of sexism during a lecture, this authority figure verbally demeaned women to his class. Not only do his comments represent explicit gender discrimination against women, but they may well be sending students the message that speaking in a derogatory manner towards women is acceptable – and even something to be valued.

Moreover, this man is emphasizing his masculinity and thus power in this space – as well as the power held by all other men in the environment.

> *My math prof last year was this old white man and he was a really good prof in terms of like teaching the contents stuff .... But he'd make really stupid comments all of the time that would like, upset me so much. Like he'd be like ....ummm... he'll just be like "oh guys just sit back and let the ladies do the work" or something like that. Or just like unnecessary comments because he was trying to be funny, but it would just upset me.   Denise*

The statement made by this professor sends his students several powerful messages. First, female engineering students are *women.* His comments emphasize the difference between male and female students, separating the former from the latter and reinforcing problematic in-group vs out-group mentalities (Tajfel & Turner, 1986). Second, his quip communicates not only that women are "other", but that women are inferior – their purpose in this environment is to be subservient to men. Third, the professor's statement sends the message that talking about and treating women in this manner is acceptable in this environment. As an agent of socialization, this professor uses his influential position to reinforce the marginalization of women in this space. Together, these messages powerfully suggest discriminatory values and goals characterize engineering, while simultaneously demonstrating the (gendered) power dynamics at play. Moreover, that students receive such messages from an authority figure like a professor is particularly concerning. The multiple signifiers of power possessed by this individual (i.e. professor, male, organizational veteran / "insider") may indeed serve to give extra weight and legitimacy to these ideologies; authority figures can be instrumental in individuals' formations of their self-concept within a profession (Gibson, 2003).

While such sexist messaging is damaging, this woman went on to describe another comment made by the same male professor that could have particularly dangerous implications, once again raising concerns about the safety of women in this environment.

> *The absolute worst one he's ever said was on the last day of class he gave us um… a trick to make like this math solution easier…. And he was going off on a tangent about like how life's about making things easier cuz everyone wants to make their lives easier…and he was like "guys here's a tip. Just get married and let your wife do all of the work…" which that already upsetted me, and then he just kind of randomly added for no reason at all…. He's like "A woman should be ch-chained to the kitchen sink but the chain should be long enough to extend to the bedroom." And like that was absolutely…awful. A professor should NOT be saying that.. so.. yeah……Denise*

The message that this ostensible role model is sending the men and women in his class is clear, overtly sexist, and victimizing. While this statement again communicates to students that this kind of dialogue is acceptable as a professional working in this field, even worse, it normalizes and perpetuates violence against women. Suggesting that women should be chained up and enslaved to perform sexual acts and domestic labor, is a quintessential example of this social ill (Price, 2005). The humourous manner in which this message is shared undoubtedly diminishes the gravity of gender-based violence and constructs the subject as a joke in this space. In doing so, this agent of socialization condones this behaviour – and by extension, implicitly encourages its enactment – ultimately suggesting frightening goals and values of this environment to his audience. Moreover, the simultaneous message being received by the female recipients of this dialogue, could be that should they remain within the engineering field, they may encounter violence.

The repercussions for women violating their assigned gender role can indeed be severe. Studies show that men and women who act in ways that contradict their assigned gender can experience sex-based mistreatment (e.g., Berdahl, 2007; McLaughlin, Uggen & Blackstone, 2012; Waldo, Berdahl & Fitzgerald, 1998). The masculine nature of engineering may result in this career path being seen as an *in*appropriate way for women to "do gender" (West & Zimmerman, 1987), ultimately inciting resistance from others in the environment. Kimmel (2013) connects the feeling of aggrieved entitlement among men, to cases of femicide. He explains that threatened masculinity and the perceived displacement or loss of entitled space, can result in acts of violence against women (Kimmel, 2013). As a particularly alarming example, Kimmel (2013) categorizes the Polytechnique massacre in 1989 as a case of aggrieved entitlement; the perpetrator, Marc Lepine, reacted to his admissions rejection from a college program (to which he perceived himself entitled) by blaming women who were entering said space. Kimmel (2013) argues that Lepine's murder of 14 female engineering students represents an extreme reaction to threatened masculinity and women's advancement in masculine domains. Gender-based violence is a terrifying reality, and the perpetuation of sexist, violent discourse – as demonstrated by the professor quoted above – makes light of events like Polytechnique, and further normalizes violence against women in engineering and throughout society.

As disturbing as this male professor's discourse was, the young woman who shared this experience expressed that she did not report the incident. She also communicated that her peers were unlikely to report it either. Young women in this study often expressed an apprehension to report any encounters of this nature that were perceived to be "normal" or reflective of what they would have to deal with in engineering.

This silence could very well be the result of the internalized power dynamics of this environment that young women are socialized to understand and adopt. Interactions such as

those described above, teach female engineering students that within this space, the power structures in place favour men and place women as inferior. They are taught, through incidents like the aforementioned, that they are not taken seriously, that their safety is unimportant, and that inevitably, they will be dismissed should they raise concerns. By communicating the power of men in various ways (while shaping perceptions of acceptable, normal behaviour in this environment) these actions by male authority figures may be having the effect of squashing female voices. In fact, such experiences may signal to women that reporting such an incident would mean questioning engineering culture itself (i.e. its values) – a daunting proposition for young women who hope to be a part of this field.

At the same time, the reluctance of young women in this study to report incidents of sexism could in fact represent an internalization of sexist behaviour. In a study of gender and engineering by Dryburgh (1999), female students were found to deny sexist behaviour in their program, labeling any sexist incidents as the exception to what they viewed as an inclusive culture. Dryburgh (1999) proposed that the denial of sexism and construction of sexist behaviours as exceptional, act as both a coping mechanism for young women and a means of aligning themselves with the dominant group who are constructed as powerful. By behaving in non-threatening ways with respect to the dominant culture (i.e. not reporting incidents of sexist behaviour), women can assimilate and avoid more "other"ing (Dryburgh, 1999). Similarly, the reluctance to report sexist incidents discussed within this study could constitute the internalization of sexism as a coping mechanism for women in this space; women who are socialized into the masculine environment of engineering may brush off instances of sexism in an attempt to align themselves with their desired in-group (i.e. men). Attempting to align themselves with in-group members, women in the out-group may come to see such exchanges as "a normal part of their reality", and hence not something to refute. However, although women

could be internalizing instances of sexism in order to cope, internalized sexism can have negative consequences; sexist incidents can contribute to negative mental health among women (Szymanski et al., 2009).

In summary, several participants expressed distress about the comments and behaviors made by males in positions of power within this environment, some of which made them feel unsafe. However, the threat felt by at least one woman in this study, also extended to her peers, and took an even more tangible form.

A Sexual Threat

The traditional construction of women as submissive and men as dominant perpetuates narratives in which gender-based violence are not taken seriously (Griffin, 1971). Indeed, violence is overwhelmingly gendered, as women are the most common victims of violence (Price, 2005). Moreover, legal definitions surrounding violent crime were defined by and for men – historically (and currently) gender and sexual violence have been swept under the rug and treated as "lesser" than male-targeted violence (Price, 2005; Griffin, 1971; Mason 2017). Rape – and the fear of rape – are also part of women's consciousness on a daily basis; women have been socialized to expect mistreatment (physical and sexual) from men (Griffin, 1971). Indeed, gender socialization rewards young men for aggression, assertiveness, and sexual violence (constructed as sexual prowess) (Griffin, 1971).

At the same time, with the recent #MeToo movement and the increase in awareness of sexual assault and harassment, women have been coming forward to disclose sexual crimes committed against them to a greater extent, providing stories and support to each other (Fortado, 2018). With this rise in awareness, post-secondary institutions are also facing an increasing number of investigations related to the rate of sexual violence occurring on campuses and are being exposed for the significant amount of work still needed when it comes to ensuring the safety of their

students in this area (Lee & Wong, 2017). This problem is nation-wide in Canada. For example, a recent study found that more than 4,000 post-secondary students in Ottawa (i.e., 1 in 4 respondents) reported that they were sexually assaulted during the 2017-2018 academic year (Payne, 2019). Various aspects of university culture such as frosh week, alcohol and drug consumption, and fraternities may be fostering the conditions that perpetuate this violence (Quinlan et al., 2017); "rape culture" is the perpetuation of sexual violence as normalized and excused through vessels such as the language used to describe sexual violence, the media, and traditions or rituals (Gladu, 2017; Quinlan et al., 2017).

Importantly, the constant fear of sexual violence controls women and their behaviour (Griffin, 1971); this fear is a part of women's daily lives, causing them to avoid certain areas due to the possibility of victimization (Gordon & Riger, 1989). As described above, a university professor's normalization of gender-based violence was depicted through his comments in class. These young women are not far from sexual and/or gendered violence, given both the rates of this mistreatment throughout Canadian Universities, and the ideologies being presented to them by socializing agents.

In my discussions with Melinda around the underrepresentation of women in computer engineering (her field), her answer led the conversation in a different direction, revealing identified sentiments of vulnerability that may lie at the heart of women's dissuasion from the field.

> *…In engineering and…in classes it isn't necessarily a place that women always feel … safe…There's been a lot of experiences that myself and others in my program have had that … uh… kind of make it like….. a lot of the people make it feel a little unsafe…Melinda*

I asked Melinda to elaborate.

…Um, in terms of last year I…did have a classmate, um, following me between classes, um… after an exam waiting outside my room for …5 hours I think it was. And eventually I had to go and report that to the school because he's threatening to get into my room…and I was like that's…horrifying…Melinda

In the previously mentioned news article discussing the rates of sexual assault at post-secondary institutions, the study further found that 23.7% of university students reported that they were stalked in the 2017-2018 academic year (Payne, 2019). Without prompt, Melinda expanded her narrative to elaborate on other aspects of violence against women at her university.

…I know a couple of my friends have…experienced assault within the university…Melinda

She continued on to a discussion of engineering party culture, and how incidences of sexual harassment and attempted assault are dealt with by students.

At one of my first engineering parties that I went to in first year they ended up banning, uh, two other first years from engineering parties because they had a girl cornered… and they were refusing to let her go without kissing her. And so one of the flightsuit committee people walked up and they said 'get out and don't come to anything' (nervously laughs)…Melinda

I asked Melinda whether she felt that students banning other students from parties was an adequate response to this incident.

I mean… it's…. there's only so much power that certain people have, and if it's something that's happening off campus at an event ….like….there's not much involvement for the school…Melinda

This woman felt that the university was not required to get involved in incidents that occurred off-campus – regardless of the fact that the incident took place at a university engineering party and involved university students. This perspective is not only contrary to the actual scope of university responsibility in such cases (Napolitano, 2015) (and hence demonstrates the lack of knowledge among numerous students about this important matter), but the perception that other engineering *students* should deal with assault attempts of this nature is dangerous; this belief could discourage students from seeking support from the school or law enforcement. Relatedly, women's safety and avoidance of harm could be (problematically) portrayed as their own responsibility (Gladu, 2017); the lack of assistance may suggest to women that they must combat their mistreatment independently or alter their behaviour to avoid being victimized in the first place. Indeed, this mentality has been seen by myself in the learning environment; in a (non-engineering) course that I took, a large portion of the content revolved around teaching students the ways that women can adapt to environments wherein they may face sexism and sexual harassment. This kind of messaging socializes women into a role of personal responsibility for how others treat them (Gladu, 2017), further perpetuating sexist power dynamics and normalizing the negative treatment of women.

Finally, this event itself reaffirms that gender-based violence is a reality for female engineers. Whether experiencing this mistreatment oneself or bearing witness to it at a party or social event, young women are learning that their compromised safety characterizes this space. Incidents in which women are faced with gendered violence, harassment, stalking, and assault attempts, socialize women around the values, goals and power dynamics of engineering (i.e. male superiority and control; the rejection of women from this space), and serve to encourage constant vigilance and self-monitoring.

Conclusion

Through interactions with male role-models and peers, young women are absorbing information about the power dynamics (i.e., politics) within the environment (and where they fall within them), as well as some of the values and goals that constitute this space (Chao et al., 1994). These interactions may not only make women feel "othered", but in some cases, also makes them feel unsafe. Whether violating their privacy, making their mistreatment the punchline of jokes, or exposing them to tangible instances of gender-based violence, it appears that for some women, the engineering environment is one that is characterized by a "threat in the air" – a place where they are vulnerable and in danger of harm.

Chapter 7 A Taste of the Field: Concluding Thoughts

This research investigated how engineering school may socialize women in ways that discourage them from staying in the field. In this thesis, I proposed that damaging gender-based messages that infuse the undergraduate engineering experience, are communicated by various social interactions and socializing agents, and may be shaping the feelings and perceptions that female students have about engineering and their place within it. Indeed, when outright asked about how their experiences in their engineering program have affected their understanding of the engineering profession, many participants expressed pessimistic views.

> *Yeah I think it's just… it's just obvious that we're not… quite equal. Between male and female. It's just not…sometimes it's just not fair…Meredith*

> *Umm.. like especially like….. kinda the fact that she [a woman] might be working the same job as another one – as another male engineer – but she's getting paid less…Krysta*

When reflecting on an encounter during frosh week, Gwynne recalled having one of her suggestions ignored by the group, only to have a male peer make the same suggestion and receive praise. She applied this directly to her expectations of working as a professional engineer.

> *It does make me also a little bit nervous for what will happen in the future when I'm actually like, in the workplace…and…not receiving credit for something career-wise…Gwynne*

Some women also expressed how their perceptions and feelings towards professional female engineers have changed in light of their own encounters, as well as how they subsequently approach their own search for a job or employer.

I feel like it's kind of .... It's definitely like, given me more respect for ....like if I see female engineers in the field like, I feel like they have almost had to work harder to get there. Especially…. Yeah…. Like if you're working in the field or like if you have a female in a management position, she's had to work a lot harder to get to that position than uhh if it were a male in that position...Krysta

Yeah I would want [a job] that already has like a decent number of female workers cuz if its somebody who's – even if they're offering me, like, extra bonuses or whatever ... there is a question that comes which is like 'well if you're offering all this why don't women already work here?' [Laughs] That sort of thing ...Melinda

That women's perceptions of the field of engineering are affected by their experiences in engineering school was communicated directly to me by many in this study, as well as suggested by the other thoughts and feelings women shared during our conversations. Many of these women are tuned in to the gender-based obstacles they will undoubtedly face should they choose to remain in this field. While some were hesitant to declare that outright gender discrimination would form a part of their futures, they often alluded to and discussed sexism in various ways, including when reflecting on pay inequity, being undervalued, having to work harder than men, and feeling unsafe. Through engineering school, young women are encountering various signals of what life might be like as a female engineer, forming first – and problematic – impressions of the field. When analyzed through an organizational socialization lens, these signals arguably represent the transference of several critical types of knowledge.

First, the numerical under-representations of women in this space – both students and professors – may be communicating critical information about the skills, knowledge and abilities expected to do the job of engineering. As outlined in Chapter 4, participants shared their experiences of being underrepresented in the engineering school environment at all levels,

expressing frustration with not only the lack of female students but the lack of female role models available. Failure to see similar others in the environment may lead women to question if they have the proficiencies needed to succeed (Chao et al., 1994), or in fact – by virtue of their gender – they somehow lack key characteristics or skills required for the job. After all, very few women seem to be drawn to this profession (as suggested to them by the numerical underrepresentation of female students) or succeed in attaining career positions (as suggested to them by the numerical underrepresentation of female professors). This experience may serve as a powerful referent cue (Bauer et al., 2007) informing young women about "what it takes" to succeed – in this case, being male. At the same time, women may also be learning about the politics of this space through their numerical underrepresentation, demonstrating that within this environment they are in the minority and lack substantive power.

Second, in Chapter 5, the feelings of visibility characterizing several women in this study were revealed. This sense of being watched by male peers led some to engage in heightened self-monitoring and vigilance about their behavior, and at times, interfered with their ability to be productive in this environment. Various participants also expressed their frustration about gendered and sexist comments made by male peers, particularly those disguised as jokes or teasing. When presented in this way, women are left to question whether they are reading into what *feels* like mistreatment, but it is difficult to pin down. Together, these realities create feelings of discomfort for women. Moreover, the objectification and "othering" imbued within both their visibility and couched mistreatment, may ultimately serve as powerful relational and political cues (Chao et al., 1994). These social experiences may teach women much about how they are socially viewed – that they are "lesser than", "other" and/or "undeserving of group membership" – messages that also signal the power structures and hierarchies of the environment that disadvantage them further.

Finally, the normalization of gender-based aggression or violence via interactions with peers and authority figures emerged in Chapter 6 as a concerning theme of this research. Several women expressed feeling "unsafe" and/or shared disturbing examples of how they or their female peers had been exposed to comments and behavior that made them vulnerable. That in some cases, sexist views were communicated by authority figures – and at times in "humourous" ways – suggests gender-based violence is acceptable and inconsequential within this environment. Further still, these experiences demonstrate to women that if they do continue to pursue a career in engineering, gender-based mistreatment and violence will almost certainly confront them at some point in the future. Together, these interactions reveal much about who is in power within this environment, and how this power is used. By extension, this political knowledge may dissuade women from coming forward with their mistreatment. Moreover, women may be learning much about the organizational goals and values of engineering – for example, the rejection of women and keeping engineering a male space.

Contributions and Implications

This thesis has important implications for theory and practice. First, with a background in gender studies, I approached this research through a feminist lens, using feminist theory. A feminist epistemological approach provides women with the opportunity to be knowledge producers, whereas historically, women have been excluded from dominant knowledge production (Code, 2014). This research provided women with the space and the vehicle to produce knowledge. Semi-structured interviews allowed the participants to lead the discussion towards their own experiences and concerns with their undergraduate program and women in engineering. Moreover, unlike traditional research, which typically compares women's experiences to those of men (Ranson, 2003), this study focuses on the unique experiences of women as valuable insights into structural and systemic issues. By privileging these women's

personal experiences in this space, without comparison to men's experiences as the baseline, this research has approached the environment of engineering school in a unique way. Rather than asking *what can women do to fit into this space?,* I have asked *what about this space discourages women from being a part of it?* Ultimately, this research aimed to remove the blame from women who experience gender-based discrimination, and interrogate the masculine culture that they are working in.

Second, this research combines organizational and gender socialization theory, along with social identity theory to analyze the experiences of would-be women engineers, and the gendered dynamics they encounter in engineering school. Gender socialization theory informs the construction of the engineering school environment and profession as rigidly masculine, thus creating a space where women do not "fit". Social identity theory helps to explain the social dynamics that emanate from this environment, and a potential motivation to "other" women who attempt to infiltrate the dominant group. Organizational socialization theory is then used to demonstrate how the dynamics of this environment are taught to women seeking entry, outlining the various dimensions of information that they receive about the space itself – and the associated messaging that tells them they do not belong. Together, this research provides an integrated theoretical framework that can be used in future research seeking to understand the gendered dynamics of socialization in STEM fields.

Third, the results of this study suggest that there are some things engineering schools (and other STEM disciplines) can do, to improve their environments and encourage women's feelings of belonging (also see Appendix E). Engineering schools can hire more female faculty, Tas, and guest lecturers from the field, in order to provide young women with female role models. In doing so, more power would be granted to women in this space, and the signal would be sent to female students that they indeed have the proficiencies required to succeed in this

field. Further, schools could work to ensure that female faculty members are assigned core engineering courses to teach (as opposed to being relegated to "softer" courses), again working to reverse damaging messages around the lack of fit and power of women in this space. As many women expressed awareness about being heavily outnumbered in their program, recruiting a greater number of female students should also be an important goal – an objective which would simultaneously help to combat the feelings of visibility described by participants. While balancing gender ratios may be a long-term effort, to encourage this objective, existing female students could be engaged as recruiters to bring in more female students, sending preliminary signals to potential candidates that they do have a place in this environment. At the same time, a campaign to encourage male students to become allies for women in engineering could help normalize the inclusion and acceptance of women in this space. These measures would also serve to socialize male engineering students into a more inclusive environment, which would promote inclusivity in the engineering workplace of the future.

The findings of this research also suggest that engineering schools must strive to prevent implicit and explicit gendered mistreatment of female students in the form of inappropriate and disrespectful jokes and commentary. While universities may have had some success decreasing the occurrence of explicit sexism during frosh week (as suggested by several participants in this study), covert and implicit mistreatment continues to negatively affect female students, routinely materializing during everyday encounters. Whereas it is difficult to monitor the behaviour of every student, implementing sensitivity training during orientation week (as well as mandatory class-based refresher seminars), could help mitigate some of this mistreatment – both through education and the fostering of norms supporting equality and respect. A study by Lindsey et al. (2014) found benefits in sensitivity and diversity training – in particular, practices that allow participants to place themselves in someone else's shoes. Importantly, as a good deal of this

mistreatment appears to be at the hands of some professors, mandatory sensitivity training should also be required of all faculty and staff.

Finally, young women have the right to feel comfortable and safe at school. The first step to preventing sexual violence on campus is a thorough and strong sexual violence policy. This policy should explicitly include the behaviour of students off-campus. However, the execution of the policy is equally important, ensuring that all students are educated about the prevalence, prevention, and consequences of sexual violence on university campuses, as well as the specific procedures and supports available to them at their own institution. As suggested by women in this study, many students are unaware of these matters, emphasizing the need for interventions in this area.

Resistance

Many women in this study expressed negative perceptions of how they are treated as engineering students and could be treated in the engineering profession. A small number of women, however, also described personal rebellion against their environment. In a feminist critique of patriarchal structures and a survey of feminist pedagogy and dynamics, Magda Lewis (1990) describes resistance as "the struggles against social forms that are experienced as oppressive," (p. 469). Bringing this concept into a modern-day North American context, Estes (2017) outlines the recent efforts of American women struggling against Trump's conservative America and its constraint and removal of women's rights. In a highly publicized example of women's resistance, January 2018 saw women's marches around the world in protest of Trump's policies and increased state control. Other research has also analyzed women's resistance to various patriarchal systems that oppress them, spanning many cultural contexts globally. For example, expectations of women in the Mwea to provide free labor in irrigated Kenyan rice settlements in Kenya were met with women deserting their husbands, depriving them of aide

with land and within the home (Kandiyoti, 1998). As Kandiyoti (1998) explains, analyses of women's coping and resistance strategies can help gain a better understanding of the patriarchal structures they are operating within. New coping and resisting strategies can emerge, depending on the political and personal struggles that women are faced with.

Finally, hitting even closer to home, on December 6th, 1989 a gunman opened fire into a classroom full of engineering students at École Polytechnique in Montreal, proclaiming to hate feminists (Lewis, 1990). In a famous example of resistance within an engineering context, Nathalie Provost stood up to a gunman, telling him that they were not feminists and were just studying engineering (Lewis, 1990). Nathalie was shot multiple times by the gunman (Lewis, 1990), ultimately becoming a public figure appreciated for her bravery. Though an extreme example, this incident demonstrates women's agency and strength in the face of patriarchal oppression, even in life-threatening situations.

One woman in this study expressed resistance to the masculine environment via verbal defense mechanisms and a refusal to assimilate. This participant described changing from an approach of trying to fit in by minimizing her gender, to one of rebellion by being explicit about her femininity:

> *What I started doing I think maybe like last year, is like, I don't care – if I have something to say, especially if I'm around my friends, I will say it. I'll be like "ughhh my cramps" you know? Like "ugh" and then I'll start talking about my outfits…. Like today I asked my friends like, if they all thought my outfit was cute. Like I don't care. They're guys. At this point I'll just….. anything you have to say I'll just say it…Corrine*

Women who socially rebel by refusing to blend in or minimize their gender, may be exercising resistance against what is constructed to be a rigid social environment wherein

femininity is not accepted. These women may be deliberately rejecting the dominant *in-group,* choosing instead to re-define what it means to belong in engineering. While the woman expressing the sentiment above was an outlier in this study, future research should consider focusing specifically on how women may engage in active forms of resistance in this environment, and the motivations behind this resistance.

To this end, one potential area of inquiry could be women's performance of masculinity, otherwise known as "female masculinity" (Halberstam, 1998). As a social construct, masculinity is something that can also be expressed by women and could be seen among female engineers attempting to combat their mistreatment. Indeed, women in male-dominated fields have been found to strategically perform their gender in ways that help them assimilate to the workplace culture, and thus be treated equally (Powell, Bagilhole & Dainty, 2009). In essence, by strategically presenting themselves as "one of the boys", female engineers may attempt to reclaim power in this environment.

Elissa referred to herself as a tomboy, emphasizing her feelings of belonging within an engineering world that constitutes mostly men. Upon asking her what made her feel like "one of the boys", she expressed various gendered stereotypes – defining "one of the boys", and herself, in opposition to femininity:

> *I feel as though it's more of a behavioural aspect…. Umm… because I've always been a tomboy. Like, I was in the cadet program ….umm…. whenever I was a kid I would climb the monkey bars and play with the hot wheels instead of the Barbie dolls so I was always "one of the boys"….. but um…. Yeah I think it's more of a behavioural aspect rather than an actual physical thing or like an attitude ... well it is an attitude thing but ...uh…. Being one of the boys is…. I'm not sure how to describe it it's.. there are some aspects that are feminine? Like I find for example gossiping is quite a feminine behavioural*

> *thing? Whereas whenever you're one of the boys you're just going out to have*
> *fun kind of thing and you're taking things as they go…Elissa*

This young woman could be expressing female masculinity by aligning herself with the social in-group, which includes mostly men. In defining herself in opposition to femininity, she is able to exaggerate the differences between herself and the social out-group (i.e. women). This could be a form of resistance to gendered mistreatment – by becoming "one of the boys", a woman may be able to combat sexist treatment anticipated in a male-dominated environment.

At the same time, Erica avoided gendered generalizations entirely, appearing to consider herself a member of the engineering space and labeling it as inclusive. Throughout this interview, this participant emphasized the positive aspects of the engineering environment, and at times, appeared to purposefully defend her program. On the one hand, this could very well reflect her reality and the fact that men and women are treated equally from her perspective. Alternatively, this could constitute resistance to being a part of a space wherein women are marginalized. By expressing her belief that men and women are equally treated, it is possible that this participant is displaying coping; believing one's self to be a part of the in-group (engineers) could help an individual avoid the discrimination faced by the out-group (women) (Dryburgh, 1999). When asked whether she perceived her male colleagues as more confident than her female colleagues, Erica explained that one cannot generalize by gender.

> *It depends on the person.. Umm.. like some girls out there are sooo confident*
> *..and then there's some girls who are not confident at all and same with guys –*
> *some guys are just super confident where at the points they're just really cocky*
> *its really annoying and then there's some guys who are so not confident at all*
> *so it depends on the person you can't you know generalize.*

While these three women appeared to be outliers when compared to the experiences of other participants in this study, it is important to acknowledge and value perspectives that do not necessarily fall into the majority. In order to gain a thorough and productive understanding of the lived experiences of women in male-dominated environments, it is important to accept all women's personal realities.

Limitations & Future Research

Several limitations and paths for future research can be identified. While the qualitative nature of this study allowed for an in-depth exploration of women's experiences, that all the interviews were conducted from students at the same university somewhat limits the generalizability of this research. For example, it remains possible that young women in engineering school at different universities have different experiences due to varying campus cultures, policies and potential initiatives in-place; if a university has taken steps to mitigate gendered mistreatment, young women in those spaces may experience less or different forms of gendered treatment. Smaller, private schools could also yield different results than larger, public schools with regards to young women pursuing engineering post-university. For instance, if a school is same-sex, it could be inferred that the gender dynamics would be different than co-ed universities.

Second, the experiences of women in engineering school could also vary across cultural contexts. For example, in global cultural contexts that vary from the Western perspective, women's experiences both in engineering school and in the workplace, could be different. The results of this study are important, but a broader scope could strengthen the findings, particularly when it comes to their practical implications.

Third, an intersectional analysis is crucial in studies of mistreatment (Rodriguez et al., 2016; Acker, 2000). However, sexual identity, gender identity, and physical ability were not

addressed in this research, as no participant related these identities to their experiences. Similarly, no participant explicitly expressed race as influencing their experiences in engineering school. Given the nature of semi-structured interviews, I was prepared for participants to lead the discussion in such directions should they so choose. Though I did not push participants to discuss issues that they did not naturally volunteer in the conversation, I did probe when these identities were mentioned in passing. In all cases, participants did not elaborate on their racialized experiences or how this identity may have affected them in their undergraduate program. It is possible that my own whiteness affected the willingness of these participants to openly discuss racialized experiences. Participants could have viewed me as an outsider to their visible minority status, potentially causing them to distrust me, or to believe that I would not understand their experiences due to my whiteness. Thus, this study may not be generalizable to those characterized by multiple marginalized identities, revealing a critical avenue for future research to pursue; additional work exploring how female students' intersectionality impacts their socialization experiences in engineering school, is required.

Fourth, while the majority of women in this study discussed how the dynamics in their classrooms and among peers were problematic in various ways, several young women described gender-based issues within their Co-op experiences. For example, when asked about feeling singled out by her gender, Paula explained that she did not experience this as frequently while on campus, but that her negative experiences as a woman in her co-op placement were telling.

> *…When I got a job and when I went on coop that's where I started to notice it, and I went "oh this is a really rude awakening"…Paula*

Though exploring the dynamics of the Co-op experience was outside the scope of this study, future research should explore how women engineering students are being socialized both

on and off campus, whether such experiences are gendered, and if they are impacting women's perceptions of the field itself.

Fifth, research should explore the modern male perspective on gender dynamics within engineering school, and in particular, *men's* experiences with the masculine culture of engineering. While a central aim and strength of this study was to learn about the experiences of women in engineering, and to do so in a way that did not compare these experiences to those of men (Ranson, 2003), hegemonic masculinity (Connell, 2005) argues that society privileges a single normative ideal of male behavior, favouring a traditional, strong, and tough expression of masculinity. Thus, men within the context of engineering school could also be negatively affected by the masculine culture and the rigidity of the hegemonic masculine ideal, should they choose to "do gender" in a way that departs from the traditional conceptualization (e.g., West & Zimmerman, 1987; Berdahl, 2007; McLaughlin, Uggen & Blackstone, 2012; Waldo, Berdahl & Fitzgerald, 1998). At the same time, several participants in this study expressed that they had male friends they considered to be allies – men who would defend them or express an understanding or sympathy with regards to the gender dynamics that these young women experienced. Future research should thus also explore the role of male allies in engineering environments, investigating their experiences and the potential benefits of male allyship in this space.

Finally, research seeking to understand why women choose not to pursue a career in engineering despite joining engineering school, could also be enriched by speaking to female students who started off in engineering programs, but are now pursuing alternate degrees. In doing so, an even more nuanced understanding of the factors that may lead women to withdraw could be obtained. At the same time, exploring the experiences and perspectives of women working as professional engineers (i.e. post-university) could also provide insights into the

factors that encourage women to persist in spite of potential (negative) gendered experiences. A potential future research question could be: *Why do the women who remain in the field of engineering persevere?* Moreover, comparing the perspectives of women who work in the field of engineering to the expectations of women in engineering school, could provide interesting insights into the differences and/or similarities in the processes of socialization occurring in these domains; newcomers to engineering school could have different experiences than newcomers in the engineering workplace. A study by Bastalich et al. (2007) found that women are told by coworkers and even by other women in engineering to "laugh off" sexism or simply assimilate to become "one of the boys". Future studies should thus continue to build upon the current investigation of women's socialization and its role in women's underrepresentation in engineering, garnering the perspective and experiences of even more women.

Conclusion

This research yielded important findings, but it also served to provide me with an opportunity to grow as a researcher. In conducting this research project, my own thinking changed and evolved. I began this research with an understanding of my research question and its dynamics, that emanated entirely from my own experiences working in the field of engineering. However, after speaking with these women, my understanding of this problem grew to include dynamics that were more diverse and multi-faceted than I originally conceived. I grew to realize the complexity of realities different from my own. In particular, trying to reconcile stories shared with me that differed from my own worldview (i.e. the few women who expressed that gender differences did not exist in engineering spaces) was challenging. However, I appreciate now more than ever the importance of privileging the voices of all women, as every story forms part of a coherent whole. Whereas every researcher is biased, and truly unbiased

research practice is unattainable, practicing reflexivity allowed me to call attention my own biases and perceptions, and helped combat their associated effects.

In summary, while the process of organizational socialization is one meant to bolster the commitment, engagement and performance of its members (Chao et al., 1994; Bauer et al., 2007), it appears that this same process may be having the opposite effect when it comes to women joining a rigidly masculine space. This study explored the experiences of women in engineering school, providing key findings that contribute to a growing body of literature on women in STEM. Women's underrepresentation in engineering is stark, and this study explored the potential role of engineering school as a socialization ground for the workplace – an environment that sends certain discouraging messages to women about the engineering field more broadly. By communicating information about what it takes to succeed in this field, how women are viewed by others in this space, the power structures that characterize the environment, and the values and goals that direct the behavior of those within it, young women are taught that this space is constructed for men, and women are not meant to fit in. These women are learning through overt and covert messaging that they are not part of the in-group – simply because of their gender.

Works Cited

Abrams, D., & Hogg, M. A. (1999). *Social identity and social cognition*. Oxford: Blackwell.

Acker, J. (2000). Revisiting class: Thinking from gender, race, and organizations. *Social Politics, 7*(2), 192-214. doi:10.1093/sp/7.2.192

Anzaldúa, G. (2013) The new Mestiza nation: A multicultural movement. In C. McCann & K. Seung- Kyuung (Eds.), *Feminist theory reader: Local and global perspectives* (3rd ed., pp 277-284). New York: Routledge.

Ayre, M., Mills, J., & Gill, J. (2013). 'Yes, I do belong': The women who stay in engineering. *Engineering Studies*, 5(3), 216-232.   doi:10.1080/19378629.2013.855781

Bastalich, W., Franzway, S., Gill, J., Mills, J., & Sharp, R. (2007). Disrupting masculinities: Women engineers and engineering workplace culture. *Australian Feminist Studies*, 22(54), 385-400. doi: 10.1080/08164640701578765

Barling, J. (2014). *The science of leadership: Lessons from research for organizational leaders.* New York, NY: Oxford University Press.

Bauer, T. N., Bodner, T., Erdogan, B., Truxillo, D. M., & Tucker, J. S. (2007). Newcomer adjustment during organizational socialization: A meta-analytic review of antecedents, outcomes, and methods. *Journal of Applied Psychology, 92*(3), 707-721. doi:10.1037/0021-9010.92.3.707

Berdahl, J. L. (2007). The sexual harassment of uppity women. *Journal of Applied Psychology*, 92(2), 425-437. doi: 10.1037/0021-9010.92.2.425

Block, K. (2012). Communal Male Role Models: How they influence identification with domestic roles and anticipation of future involvement with the family. *University of British Columbia's Undergraduate Journal of Psychology*, 1, 87-102. Retrieved from https://ojs.library.ubc.ca/index.php/ubcujp/article/view/2522/182454

Brainard, S. G., & Carlin, L. (1998). A six-year longitudinal study of undergraduate women in engineering and science. *Journal of Engineering Education*, 87(4), 369-375. https://doi.org/10.1002/j.2168-9830.1998.tb00367.x

Brooks, A., & Hesse-Biber, S. N. (2006). An invitation to feminist research. In P. Leavey (Ed.) *Feminist research practice : A primer* (pp. 1-24). Thousand Oaks, CA: Sage Publications. Retrieved from https://ebookcentral-proquest-com.proxy.library.carleton.ca.

Brown, C. S., & Leaper, C. (2010). Latina and european american girls' experiences with academic sexism and their self-concepts in mathematics and science during adolescence. *Sex Roles, 63*(11), 860-870. doi:10.1007/s11199-010-9856-5

Buse, K., Bilimoria, D., & Perelli, S. (2013). Why they stay: Women persisting in US engineering careers. *Career Development International,* 18(2), 139-154. doi:10.1108/CDI-11-2012-0108

Calogero, R. M. (2004). A test of objectification theory: The effect of the male gaze on appearance concerns in college women. *Psychology of Women Quarterly,* 28(1), 16-21. doi:10.1111/j.1471-6402.2004.00118.x

Canadian Charter of Rights and Freedoms, s 15, Part I of the Constitution Act, 1982, being Schedule B to the Canada Act 1982 (UK), 1982, c 11.

Canadian Engineering Undergraduates: Female Enrollment by Discipline. (n.d.b). Retrieved from http://www.onwie.ca/resources-tools/statistics/canadian-engineeringundergraduates-female-enrollment-by-discipline

Carter, M. (2014). Gender socialization and identity theory. *Social Sciences, 3*(2), 242-263. doi:10.3390/socsci3020242

Cech, E., Rubineau, B., Silbey, S., & Seron, C. (2011). Professional role confidence and gendered persistence in engineering. *American Sociological Review*, 76(5), 641-666. doi: 10.1177/0003122411420815

Chao, G. T. (2012). Organizational socialization: Background, basics, and a blueprint for adjustment at work. In S.W. Kozlowski (Ed.), The Oxford Handbook of Organizational Psychology (vol. 1, pp. 579-614). New York; Oxford: Oxford University Press.

Chao, G. T., O'Leary-Kelly, A. M., Wolf, S., Klein, H. J., & Gardner, P. D. (1994). Organizational socialization: Its content and consequences. *Journal of Applied Psychology*, 79(5), 730-743. doi:10.1037/0021-9010.79.5.730

Code, L. (2014). Feminist epistemology and the politics of knowledge: Questions of marginality. In M. Evans, C. Hemmings, M. Henry, H. Johnstone, S. Madhok, A. Plomien & S. Wearing (Eds.). *The sage handbook of feminist theory* (pp. 9-25). London: Sage [Publishing.

Concordia University engineers rewrite frosh chant songbook. (2014, March 12). CBC News. Retrieved December 3, 2018, from https://www.cbc.ca/news/canada/montreal/concordia-university-engineers-rewrite-frosh-chant-songbook-1.2569306

Connell, R. (2005). *Masculinities* (2nd ed.). Berkeley, Calif: University of California Press.

Cooper-Thomas, H.D., & Anderson, N. (2006). Organizational socialization: A new theoretical model and recommendations for future research and HRM practices in organizations. *Journal of Managerial Psychology,* 21, 492–516. https://doi.org/10.1108/02683940610673997

Cortina, L. M. (2008). Unseen injustice: Incivility as modern discrimination in organizations. *The Academy of Management Review*, 33(1), 55-75. doi: 10.2307/20159376

Craene, V. D. (2017). Fucking geographers! Or the epistemological consequences of neglecting the lusty researcher's body. *Gender, Place & Culture,* 24(3), 449–464. doi: 10.1080/0966369X.2017.1314944a

Degrees, Diplomas, and Certificates Conferred by Degree Program and Sex of Students: Calendar Years 1985 to 2017. (2017). Retrieved from http://oirp.carleton.ca/databook/ongoing/students/tables/table-GR1-1_hpr.htm

Dionisi, A. M., & Barling, J. (2018). It hurts me too: Examining the relationship between male gender harassment and observers' well-being, attitudes, and behaviors. *Journal of Occupational Health Psychology*, 23(3), 303-319. doi:10.1037/ocp0000124

Drury, B. J., Siy, J. O., & Cheryan, S. (2011). When do female role models benefit women? the importance of differentiating recruitment from retention in STEM. *Psychological Inquiry*, 22(4), 265-269. doi:10.1080/1047840X.2011.620935

Dryburgh, H. (1999). Work hard, play hard: Women and professionalization in engineering-adapting to the culture. *Gender and Society,* 13(5), 664-682. doi:10.1177/089124399013005006

Eaton, A. W. (2008). Feminist philosophy of art. *Philosophy Compass*, 3(5), 873-893. doi:10.1111/j.1747-9991.2008.00154.x

Estes, C. L. (2017). Women's rights, women's status, women's resistance in the age of trump. *Generations,* 41(4), 36-44.

Faulkner, W. (2009). Doing gender in engineering workplace cultures. II. Gender in/authenticity and the in/visibility paradox. *Engineering Studies*, 1(3), 169-189. doi:10.1080/19378620903225059

Fortado, S. (2018). Workplace Sexual Abuse, Labor and the #MeToo Movement. *Labor Studies Journal*, *43*(4), 241–244. https://doi.org/10.1177/0160449X18809431

Fredrickson, B. L., Roberts, T., Noll, S. M., Quinn, D. M., & Twenge, J. M. (1998). That swimsuit becomes you: Sex differences in self-objectification, restrained eating, and math performance. *Journal of Personality and Social Psychology,* 75(1), 269-284. doi:10.1037/0022-3514.75.1.269

Fredrickson, B. L., & Roberts, T. (1997). Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psychology of Women Quarterly,* 21(2), 173-206. doi:10.1111/j.1471-6402.1997.tb00108.x

Gale, A. W. (1994). Women in non-traditional occupations: The construction industry. *Women in Management Review*, 9(2), 3-14. doi: 10.1108/EUM0000000003989

Gatenby, B., & Humphries, M. (2000). Feminist participatory action research: methodological and ethical issues. *Women's Studies International Forum*, 23 (1), 89-105. https://doi.org/10.1016/S0277-5395(99)00095-3

Gibson, D. E. (2003). Developing the professional self-concept: Role model construals in early, middle, and late career stages. *Organization Science,* 14(5), 591-610. doi:10.1287/orsc.14.5.591.16767

Gladu, M. (2017). Taking action to end violence against young women and girls in Canada: Report of the standing committee on the status of women. Ottawa: Standing Committee on the Status of Women. Retrieved from https://www.ourcommons.ca/Content/Committee/421/FEWO/Reports/RP8823562/fewor p07/feworp07-e.pdf

Gordon, M. T., 1939, & Riger, S. (1989). *The female fear*. London; New York; Free Press.

Griffin, S. (1971). Rape: The all-American crime. *Ramparts, 10*, 26–35. Retrieved from http://www.unz.com/print/Ramparts-1971sep-00026

Griffith, A. L. (2010). Persistence of women and minorities in STEM field majors: Is it the school that matters? *Economics of Education Review*, 29(6), 911-922. doi:10.1016/j.econedurev.2010.06.010

Halberstam, J, (1998). An Introduction to Female Masculinity, *Female Masculinity* Durham: Duke University Press, pp.1-9.

Harding, S. (1987). Is there a feminist method? In S. Harding (Ed.), *Feminism and methodology: Social science issues* (pp. 1-14). Bloomington: Indiana University Press.

Hayfield, N., & Huxley, C. (2015). Insider and outsider perspectives: Reflections on researcher identities in research with lesbian and bisexual women. *Qualitative Research in Psychology,* 12(2), 91-106. doi:10.1080/14780887.2014.918224

Herrmann, S. D., Adelman, R. M., Bodford, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. (2016). The effects of a female role model on academic performance and persistence of women in STEM courses. *Basic and Applied Social Psychology,* 38(5), 258-268. doi:10.1080/01973533.2016.1209757

Hesse-Biber, S.N. (2014). A re-invitation to feminist research. in S.N. Hesse-Biber, (Ed.), *Feminist research practice* (2nd ed., pp. 1-10). London: Sage Publishing.

Hirst, A., & Schwabenland, C. (2018). Doing gender in the 'new office'. *Gender, Work & Organization,* 25(2), 159-176. doi:10.1111/gwao.12200

Holth, L. (2014). Passionate men and rational women: Gender contradictions in engineering. *NORMA: International Journal for Masculinity Studies,* 9(2), 97-110. doi: 10.1080/18902138.2014.908629

Hoobler, J. M., Lemmon, G., & Wayne, S. J. (2011). Women's underrepresentation in upper management: New insights on a persistent problem. *Organizational Dynamics,* 40(3), 151. https://doi.org/10.1016/j.orgdyn.2011.04.001

Inzlicht, M., & Ben-Zeev, T. (2000). A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science,* 11(5), 365-371. doi:10.1111/1467-9280.00272

Javidan, M., Bemmels, B., Devine, K. S., & Dastmalchian, A. (1995). Superior and subordinate gender and the acceptance of superiors as role models. *Human Relations,* 48(11), 1271-1284. doi:10.1177/001872679504801102

Jayaratne, T. E., & Stewart, A. J. (1991). Quantitative and qualitative methods in the social sciences: Current feminist issues and practical strategies." In M.M. Fonow & J.A. Cook (Eds.), *Beyond methodology: Feminist scholarship as lived research* (pp. 85-106). Bloomington IN: Indiana University Press.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender and Society,* 2(3), 274-290. doi:10.1177/089124388002003004

Kimmel, M. S. (2013). *Angry white men American masculinity at the end of an era*. New York: Nation Books.

Lacey A. & Luff, D. (2007). *Qualitative Research Analysis.* The NIHR RDS for the East Midlands/Yorkshire & the Humber: Nottingham, UK.

Lee, C., & Wong, J. S. (2019). A safe place to learn? Examining sexual assault policies at Canadian public universities. *Studies in Higher Education,* 44(3), 432-445. doi:10.1080/03075079.2017.1371687

Leslie, L. L., McClure, G. T., & Oaxaca, R. L. (1998). Women and minorities in science and engineering: A life sequence analysis. *The Journal of Higher Education,* 69(3), 239-276. doi:10.1080/00221546.1998.11775134

Lester, J. (2008). Performing gender in the workplace: Gender socialization, power, and identity among women faculty members. *Community College Review*, 35(4), 277-305. doi:10.1177/0091552108314756

Lewis, M. (1990). Interrupting patriarchy: Politics, resistance, and transformation in the feminist classroom. *Harvard Educational Review,* 60(4), 467-489. doi:10.17763/haer.60.4.w1r67q5135585122

Louis, M.R., Posner, B.Z., & Powell, G.N. (1983). The availability and helpfulness of socialization practices. *Personnel Psychology,* 36(4), 857-66. doi: 10.1111/j.1744-6570.1983.tb00515.x

Luhtanen, R., & Crocker, J. (1992). A collective self-esteem scale: Self-evaluation

of one's social identity. *Personality and Social Psychology Bulletin,* 18(3), 302–318. doi: 10.1177/0146167292183006

Lyons, S. T., & Schweitzer, L. (2017). A qualitative exploration of generational identity: Making sense of young and old in the context of today's workplace. *Work, Aging and Retirement, 3*(2), 209-224. doi:10.1093/workar/waw024

Mak, B. C. N., Liu, Y., & Deneen, C. C. (2012). Humor in the workplace: A regulating and coping mechanism in socialization. *Discourse & Communication,* 6(2)*,* 163-179. doi: 10.1177/1750481312437445

Marx, D. M., & Roman, J. S. (2002). Female Role Models: Protecting Women's Math Test Performance. *Personality and Social Psychology Bulletin*, 28(9), 1183–1193. doi: 10.1177/01461672022812004

Mason, S. (1997). Social work research: Is there a feminist method? *Affilia,* 12(1), 10-32. doi:10.1177/088610999701200102

Mavriplis, C., Heller, R., Beil, C., Dam, K., Yassinskaya, N., Shaw, M., & Sorensen, C. (2010). Mind the gap: Women in STEM career breaks. *Journal of Technology Management & Innovation, 5*(1), 140-151. doi: 10.4067/S0718-27242010000100011

Mcintosh, P. (1990). White privilege: Unpacking the invisible knapsack *Independent School*, Winter, 31-36. Retrieved http://psac-ncr.com/white-privilege-unpacking-invisible-knapsack

McLaughlin, H., Uggen, C., & Blackstone, A. (2012). Sexual harassment, workplace authority, and the paradox of power. *American Sociological Review*, 77(4), 625-647. doi: 10.1177/0003122412451728

Meyer, S. (1999). Work, play, and power: Masculine culture on the automotive shop floor, 1930- 1960. *Men and Masculinities,* 2(2), 115-134. doi: 10.1177/1097184X99002002001

Moradi, B., & Funderburk, J. R. (2006). Roles of perceived sexist events and perceived social support in the mental health of women seeking counseling. *Journal of Counseling Psychology,* 53(4), 464-473. doi:10.1037/0022-0167.53.4.464

Mulvey, L. (1999). Visual pleasure and narrative cinema. In L. Braudy & M. Cohen (Eds.), *Film theory and criticism: Introductory readings*. (pp. 833-844). New York: Oxford. Retrieved from http://www.composingdigitalmedia.org/f15_mca/mca_reads/mulvey.pdf

Murphy, M. C., Steele, C. M., & Gross, J. J. (2007). Signaling threat: How situational cues affect women in math, science, and engineering settings. *Psychological Science,* 18(10), 879-885. doi:10.1111/j.1467-9280.2007.01995.x

Nagar, R., & Geiger, S. (2007). *Reflexivity and positionality in feminist fieldwork revisited.* In A. Ticknell, E. Shappard, J. Peck & T Barnes (Eds.), *Politics and Practice in Economic Geography* (pp. 267-278). London: SAGE Publications.

Napolitano, J. (2015). "only yes means yes": An essay on university policies regarding sexual violence and sexual assault. Yale Law & Policy Review, 33(2), 387-402.

Nelson, D.L. & Quick, J.C. (1991). Social support and newcomer adjustment in organizations: attachment theory at work? *Journal of Organizational Behavior,* 12(6), 543-54.

Oakley, A. (1998). gender, methodology and people's ways of knowing: Some problems with feminism and the paradigm debate in social science. *Sociology,* 32(4), 707-731. doi:10.1177/0038038598032004005

Oakley, J. G. (2000). Gender-based barriers to senior management positions: Understanding the scarcity of female CEOs. *Journal of Business Ethics*, 27(4), 321-334. doi:10.1023/A:1006226129868

Oliver, K. (2017). The male gaze is more relevant, and more dangerous, than ever. *New Review of Film and Television Studies,* 15(4), 451-455. doi: 10.1080/17400309.2017.1377937

Ostroff, C., & Kozlowski, S.W. (1992). Organizational socialization as a learning process: The role of information acquisition. *Personnel Psychology,* 45(4), 849-874. doi: 0.1111/j.1744-6570.1992.tb00971.x

Our Experts. (n.d.). Retrieved February 19, 2019, from https://carleton.ca/engineering-design/research/our-experts/

Parker, S. K., Griffin, M. A., Sprigg, C. A., & Wall, T. D. (2002). Effect of temporary contracts on perceived work characteristics and job strain: A longitudinal study. *Personnel Psychology,* 55(3), 689-719. doi:10.1111/j.1744-6570.2002.tb00126.x

Pavalko, E. K., Mossakowski, K. N., & Hamilton, V. J. (2003). Does perceived discrimination affect health? Longitudinal relationships between work discrimination and women's physical and emotional health. *Journal of Health and Social Behavior,* 44(1), 18-33. doi:10.2307/1519813

Payne, E. (2019, March 20). More than 4,000 university and college students in Ottawa say they were sexually assaulted last year. *Ottawa Citizen*. Retrieved March 27, 2019, from https://ottawacitizen.com/news/local-news/more-than-4000-university-and-college-student-in-ottawa-say-they-were-sexually-assaulted-last-year?utm_medium=Social&utm_source=Facebook&fbclid=IwAR0vsd87B2Toc6GyU29zQKJkGNKRqLPAX5heksn1vsKZ-ArijPE49Mn6Ph8#Echobox=1553125135

Percentage of Female Undergraduates in Engineering (Canada). (n.d.a.). Retrieved 24 Nov. 2017 http://www.onwie.ca/resource-tools/statistics/percentage-of-female-undergraduates-in-engineering-canada/

Powell, A., Bagilhole, B., & Dainty, A. (2009). How women engineers do and undo gender: Consequences for gender equality. *Gender, Work and Organization,* 16(4*),* 411-428. https://doi.org/10.1111/j.1468-0432.2008.00406.x

Powell, A. Dainty, A., & Bagilhole, B. (2012). Gender stereotypes among women engineering and technology students in the UK: Lessons from career choice narratives. *European Journal of Engineering Education.* (37)6. 541-556. doi: 10.1080/03043797.2012.724052

Price, L.S. (2005). *Feminist frameworks: Building theory on violence against women*. Halifax, N.S: Fernwood.

Quinlan, E. (2017). Introduction: Sexual violence in the ivory tower. In E. Quinlan, A. Quinlan, C. Fogel, & G. Taylor (Eds.), *Sexual violence at Canadian universities: Activism, institutional responses, and strategies for change* (pp. 1-26). Waterloo, Ontario, Canada: Wilfrid Laurier University Press.

Ramsey, L. R., Betz, D. E., & Sekaquaptewa, D. (2013). The effects of an academic environment intervention on science identification among women in STEM. Social Psychology of Education, 16(3), 377-397. doi:10.1007/s11218-013-9218-6

Ranson, G. (2003). Beyond 'Gender differences': A Canadian study of women's and men's careers in engineering. *Gender, Work & Organization*, 10(1), 22-41. doi: 10.1111/1468-0432.00002

Reid, C., Greaves, L., & Kirby, S. (2017). *Experience research social change: Critical methods* (3rd ed.). Toronto, Canada: University of Toronto Press.

Robnett, R. D., & Thoman, S. E. (2017). STEM success expectancies and achievement among women in STEM majors*. Journal of Applied Developmental Psychology*, 52, 91-100. doi:10.1016/j.appdev.2017.07.003

Rodriguez, J. K., Holvino, E., Fletcher, J. K., & Nkomo, S. M. (2016). The theory and praxis of intersectionality in work and organisations: Where do we go from here? *Gender, Work & Organization, 23*(3), 201-222. doi:10.1111/gwao.12131

Saks, A. M., & Ashforth, B. E. (1997). Organizational socialization: Making sense of past and present as a prologue for the future. *Journal of Vocational Behavior,* 51(2), 234–279. doi: 10.1006/jvbe.1997.1614

Sang, K.J., Dainty, A.R., & Ison, S.G. (2014). Gender in the UK architectural profession: (re)producing and challenging hegemonic masculinity. *Work, Employment and Society,* 28(2), pp. 247-262. doi: org/10.1177/0950017013491306

Schein, E. H. (1988). Organizational socialization and the profession of management. *Sloan Management Review, 30*(1), 53-65. Retrieved from http://proxy.library.carleton.ca/login?url=https://search-proquest-com.proxy.library.carleton.ca/docview/1302983001?accountid=9894

Schilt, K., & Westbrook, L. (2009). Doing gender, doing heteronormativity: "gender normals," transgender people, and the social maintenance of heterosexuality. *Gender and Society, 23*(4), 440-464. doi: 10.1177/0891243209340034

Schutt, R. K. (2009). *Investigating the social world: The process and practice of research* (6th ed.). Los Angeles: Pine Forge Press.

Seron, C., Silbey, S. S., Cech, E., & Rubineau, B. (2016). Persistence is cultural: Professional socialization and the reproduction of sex segregation. *Work and Occupations, 43*(2), 178-214. doi:10.1177/0730888415618728

Smith, D. (1974). Women's perspective as a radical critique of sociology. *Sociological Inquiry, 44*(1), 7-13. doi:10.1111/j.1475-682X.1974.tb00718.x

Speizer, J. (1981). Role models, mentors, and sponsors: The elusive concepts. *Signs, 6*(4), 692-712.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52*(6), 613-629. doi:10.1037/0003-066X.52.6.613

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*(5), 797-811. doi:10.1037/0022-3514.69.5.797

Stockard, J. (1999). Gender socialization. In J.S. Chafetz.(Ed.), *Handbook of the Sociology of Gender* (pp. 215-246). New York: Kluwer Academic/Plenum Publishers.

Szymanski, D. M. (2005). Heterosexism and sexism as correlates of psychological distress in lesbians. *Journal of Counseling & Development, 83*(3), 355-360. doi:10.1002/j.1556-6678.2005.tb00355.x

Szymanski, D. M., Gupta, A., Carr, E. R., & Stewart, D. (2009). Internalized misogyny as a moderator of the link between sexist events and women's psychological distress. *Sex Roles, 61*(1-2), 101-109. doi:10.1007/s11199-009-9611-y

Takahira, S., Goodings, D. J., & Byrnes, J. P. (1998). Retention and performance of male and female engineering students: An examination of academic and environmental variables. *Journal of Engineering Education, 87*(3), 297-304. doi: 10.1002/j.2168-9830.1998.tb00357.x

Tajfel, H. (1979). Individuals and groups in social psychology. *The British Journal of Social and Clinical Psychology, 18*(2), 183-190. doi: 0.1111/j.2044-8260.1979.tb00324.x

Tajfel, H. and Turner, J.C. (1986) The Social Identity Theory of Intergroup Behavior. In: Worchel, S. and Austin, W.G., Eds., *Psychology of Intergroup Relation*, Hall Publishers, Chicago, 7-24.

Tracy, S.J., Myers, K.K. & Scott, C.W. (2006). Cracking jokes and crafting selves: Sensemaking and identity management among human service working. *Communication Monographs 73*, 283–308. doi: 10.1080/03637750600889500

Tuhiwai Smith, L. (1999). *Decolonizing research methodologies: Research and Indigeneous peoples.* New York: Zed Books.

United Nations. (1993). Declaration on the elimination of violence against women. New York: UN.

Van Maanen, J. (1978). People processing: Strategies of organizational socialization. *Organizational Dynamics*, 7(1), 19-36. doi: 10.1016/0090-2616(78)90032-3

Waldo, C. R. (1999). Working in a majority context: A structural model of heterosexism as minority stress in the workplace. *Journal of Counseling Psychology,* 46(2), 218-232. doi:10.1037/0022-0167.46.2.218

Waldo, C. R., Berdahl, J. L., & Fitzgerald, L. F. (1998). Are men sexually harassed? If so, by whom?. *Law and Human Behavior*, 22(1), 59-79. doi: 10.1023/A:1025776705629

West, C. & Zimmerman, D.H. (1987). Doing Gender. *Gender & Society*, 1(2), 125–151.

Women in Engineering. (2017, 22 June). *Engineers Canada*. Retrieved from engineerscanada.ca/diversity/women-in-engineering

Appendix A: Recruitment Poster

Let your voice be heard!

♀ **Do you identify as a woman?**

⚒ **Are you in a Carleton Engineering program?**

☛ **Are you in 2nd-5th year?**

✔ **Are you 18-25 years old?**

🗣 **Do you want to share what this experience has been like?**

🍽 **Do you want FREE coffee?**

We are seeking **2nd-5th year women** in any **area of engineering** to **participate in a 30-45 minute semi-structured interview** about their experiences thus far. The purpose of this study is to develop knowledge that could help to increase women's representation in engineering.

> **To thank you for participation, you will receive a $15 gift-card from Starbucks.**

If you are interested in participating or have any questions, please contact Katarina Lauch at kat.lauch@carleton.ca

The ethics protocol for this project has been reviewed and cleared by the Carleton University Research Ethics Board. If you have any ethical concerns with the study, please contact Dr. Andy Adler, Chair, Carleton University Research Ethics Board-A (by phone at 613-520-2600 ext. 2517 or via email at ethics@carleton.ca).

Carleton
UNIVERSITY
Canada's Capital University

Appendix B: Participant Demographics

Participant Pseudonyms	Identifies as Visible Minority?	Year in Academic Program	Stream of Engineering	Domestic (D) or International (I) Student	Age	Full Time (FT) vs Part Time (PT)
Melinda	No	2nd	Computer	D	19	FT
Denise	Yes	4th	Environmental	D	20	PT (coop)
Elissa	No	3rd	Mechanical	D	20	FT
Erica	Yes	3rd	Mechanical	D	20	FT
Meredith	Yes (woman)	3rd	Biomedical	D	21	FT
Paula	No	5th	Aerospace	D	22	FT
Yael	Yes	2nd	Biomed Elec	D	19	FT
Tanya	No	3rd	Environmental	D	20	FT
Sophia	No	5th	Civil	D	21	FT
Patricia	Unsure	3rd	Arch-Eng CS	D	21	FT
Li	No	5th	Arch-Eng CS	D	22	FT
Alicia	No	2nd / 3rd	Biomed Mech	D	20	FT
Gwynne	Yes	2nd	Environmental	D	18	FT
Corrine	Yes	3rd	Civil	D	20	FT
Priya	No	5th	Aerospace	D	22	FT
Krysta	No	5th	Aerospace	D	22	FT

Appendix C: Interview Guide

Thank you for your participation.

In this interview, I am interested in hearing about your experiences in you program. I will be asking you about the beginning of your engineering career, classroom dynamics, your perception of yourself and others in your program, and your future in this field.
With your permission I would like to audio-record this interview. I will also be taking notes as we talk. Only my supervisor and I will hear this audio tape and the interviews will be transcribed.

Your answers will be confidential and your identity will be protected.

If you are uncomfortable answering any questions, please let me know and we can skip them.

Do you have any questions for me before we begin?

[Turn audio recording on]

Everything relates to your engineering classes specifically

1. Tell me about yourself.
   a. What year of study are you currently in?
   b. How old are you?
   c. Are you a full-time student or part-time?
   d. Are you a domestic or an international student?
   e. Do you identify as a visible minority?

2. What made you pursue an engineering degree?
   a. What were your expectations of the program?
      i. *With regards to the environment, the people, etc.*
      ii. Does your experience so far match your expectations?
   b. Thinking back to your first university experiences, how was frosh week for you?
      i. Did you perceive the atmosphere to be positive?
         1. Why or why not?
         2. In what way?
         3. How did you feel after this experience?
            a. More or less connected to your peers?
            b. Did this help you feel that you belonged?
      ii. Can you describe your frosh leader?
      iii. Did you have a nickname/call sign?
         1. Was it something that you chose yourself?
         2. If not, who chose it?
         3. Did you feel comfortable with it?
         4. What was your reaction to it?
   c. Were there other women in your frosh group?

         i.   Were they participating?

        ii.   How did you interact with them?

      iii.   Did you feel that they fit in?

  d. Have your frosh experiences affected how you view the field of engineering?

  e. Have your frosh experiences affected how you view your place in the field of engineering?

3.   How do you find the classroom environment in your program?

  a. What have your experiences with group work been like?

         i.   What role did you have?

        ii.   Who assigned you this role?

  b. When the group project was over did you feel like you contributed significantly?

         i.   Did you feel like your contributions to the group project were valued?

             1.   Why or why not?

  c. Has a professor ever told you that you were doing well?

         i.   If yes, what did they say? Why do you think that was?

        ii.   Have your male peers that you've worked with ever given you positive feedback about your skills?

      iii.   (If yes) What effect did this have?

      iv.   Have your female peers that you've worked with ever given you positive feedback about your skills?

       v.   (If yes) What effect did this have?

  d. How do you perceive your technical capabilities in relation to your classmates?

         i.   Average? Above average? Below average?

        ii.   Why do you feel this way?

  e. Do you feel that you are given the opportunity to voice your comments and questions in class?

         i.   Why not?

  f. Have your classroom experiences affected how you view the field of engineering?

  g. Have your classroom experiences affected how you view your place in the field of engineering?

4.   "Being one of the boys" What does that phrase mean to you?

  a. Is this something you relate to?

         i.   Why or why not?

  b. Would you consider that a compliment?

  c. What would make you feel that way?

  d. Do you find your male colleagues are more confident than your female colleagues?

  e. Are you the same person at school as you are at home?

         i.   Why or why not?

  f. Do you behave differently at school or with your classmates?

         i.   (If yes) How so?

        ii.   (If yes) Why do you do this?

5.   How do you see your career prospects?

  a. What are your perceptions of the field?

         i.   Do you believe that you will find a place in this field?

        ii.   Do you want to be a part of it?
       iii.   Why or why not? (probe)
    b.   Have your perceptions changed throughout your schooling?

6. Is there anything else you would like to add?

[Turn audio recording off]

Thank you for participating in this study, do you have any questions for me?
Please feel free to email me with any questions or with any additional information.

Appendix D: Debriefing Letter

Carleton
UNIVERSITY
Canada's Capital University

Title: The University Experiences of Women in Engineering

Dear Participant,

Thank you very much for participating in this study.

The purpose of this research is to contribute to an understanding of the culture of engineering school, gender dynamics, and further investigations into women's underrepresentation in the field of engineering.

You were told that the goal of this study was to research women in engineering. While this is true, the study is also seeking to investigate gender issues and socialization within engineering school. We withheld the true goal of the study as we sought your unbiased perceptions of your engineering school experience.

This study should be completed by 01 April 2019. If you would like a copy of the results of this study once it has concluded, please email Katarina Lauch (contact details below).

Your participation in this study is very much appreciated and you can be assured that your responses will be kept confidential. No one else (from your program of study or otherwise) will see your responses or know that you have participated in this study. If the content of this study has made you feel distressed or uncomfortable, and you would like to speak to someone or learn more about the issues dealt with in this study, you are encouraged to use the following websites and hotline numbers:

Confidential Helpline Good2Talk
This helpline offers support to post-secondary students throughout Ontario
Dial 1-866-925-5454 to talk any day, any time.

Equity Services
Email: equity@carleton.ca
Phone: 613-520-5622
Website: https://carleton.ca/equity/

Health and Counselling Services at Carleton
Phone: 613-520-6674
Website: https://carleton.ca/health/

Canadian Organizations Supporting Women in STEM
http://www.scwist.ca/
http://www.techgirls.ca/
http://www.ccwestt.org/

Furthermore, if you have any questions, complaints, or concerns about this research, please feel free to contact Katarina Lauch or Angela Dionisi (contact details below).

Finally, because of the possibility of compromising the data collected in this study, we ask that you please keep the details of this project confidential.

This ethics protocol for this project was reviewed by the Carleton University Research Ethics Board, which provided clearance to carry out the research. Should you have questions or concerns related to your involvement in this research, please contact:

CUREB-A:

If you have any ethical concerns with the study, please contact Dr. Bernadette Campbell, Chair, Carleton University Research Ethics Board-A (by phone at 613-520-2600 ext. 2517 or via email at ethics@carleton.ca).

Thank you again for your participation in this study. Your insights will help generate knowledge that may be used to understand women's underrepresentation in the field of engineering.

Sincerely,

Katarina Lauch

Researcher contact information:
Katarina Lauch
Department: Women's and Gender Studies
Carleton University
Tel: ▮▮▮▮▮▮▮▮▮▮
Email:
katlauch@cmail.carleton.ca

Supervisor contact information:
Dr. Angela Dionisi
Department: Sprott School of Business
Carleton University
Tel: 613-520-2600, ext. 3134
Email:
angeladionisi@cunet.carleton.ca

Appendix E: Key Findings and Suggested Recommendations

Key Findings	Impact	Recommendations	
Female role models • Very few female professors / guest lecturers • Female professors teach non-core engineering courses (e.g., CCDP) • Female professors spoken about by male students in derogatory/ sexist ways	• Implicitly communicates to female students what it takes to succeed in engineering (i.e. "maleness") and how much power women hold in this field (i.e. limited amounts) • Perpetuates damaging stereotypes about women, engineering, and the presence of women in engineering. • Ratios foster feelings of isolation, self-perceptions of (un)belonging, and the belief that women are unwelcome in engineering	• Hire more female faculty • Recruit and train more female TAs • Specifically invite female engineers to be guest speakers • Ensure that female faculty are assigned to teach core engineering courses • Integrate gender diversity in curriculum (e.g., showcase the work and success of female engineers whenever possible)	These recommendations will help ensure that more women are given substantive positions of power in engineering school. This will provide female students with a greater number of role models and help them to see a potential future in the field. At the same time, this will help male students to recognize and respect women's presence in this field
Female students (or lack thereof) • Women were struck (and negatively affected) by how few female students existed in their classes	• Women feel outnumbered, visible, and on-display • This visibility affects female students' self-confidence and ability to perform academically • Feeling "watched" leads women to consciously alter their everyday behaviours (e.g. resisting the need to use the washroom during lecture for fear of being ogled by males when exiting the classroom)	• Recruit more female students • Involve existing female students in student recruitment efforts • Promote and support female engineering groups on campus	These recommendations will combat women's feelings of isolation, objectification, and visibility. By extension, the ability of women to academically succeed in this domain (in ways that otherwise could be hampered by such feelings), will be bolstered. The integration of more female students will also contribute to the development of norms of inclusivity in the department

Sexist messaging from peers			
Sexist messaging from peers • Aggression and sexism disguised as jokes (e.g. "humour" around the competence and belonging of women in engineering) • Sexist chants and songs as normalized behaviour • Women hesitant to speak up about this (mis)treatment	• Signals to female students that they are not socially accepted / are viewed as less entitled to be in engineering school • Reinforces structural inequalities within engineering; Women are constructed as inferior and undeserving of a place in this field • Fosters feelings of vulnerability and "threat in the air" • Women may internalize the sexist messaging communicated to them overtime, coming to believe they are unworthy and deserving of mistreatment	• Implement gender-based sensitivity training during orientation week (i.e. specific to the engineering department) • Mandatory class-based, diversity-focused refresher workshops (preferably that are led by upper year male and female engineering students, and potentially involving perspective-taking activities) • Formally integrate coursework focusing on gender in STEM (possibly in conjunction with the Sociology department) • Initiate campaigns encouraging male student allyship for women in engineering (e.g., button or laptop sticker solidarity campaign)	These recommendations will help mitigate women's mistreatment, allowing women to feel more comfortable, respected and accepted within this space. Encouraging male allyship will also help normalize the inclusion and presence of women in engineering, ultimately re-shaping the culture of the department in ways that honour diversity
The normalization of discrimination and sexual violence by male authority figures • Teaching assistant was condescending to female students and overtly violated the privacy of women • Male professor known to make explicitly sexist and violent comments about	• Emphasizes socially-constructed differences between male and female students; communicates that women are "other", inferior, and subservient to men • Sends the message that talking about and treating women in this manner is acceptable in this environment • Reinforces the marginalization of women / suggests that discriminatory values and goals characterize engineering	• Mandatory sensitivity training for all faculty and staff • Implementation of an evaluation system for students to anonymously evaluate professors on matters pertaining to gender-inclusivity and respect possibly in conjunction with end-of-term course evaluations) • Professors who purport sexist and violent ideologies must be held accountable	These recommendations will help dismantle dangerous norms purporting violence against women, encourage those who may be exposed to this type of mistreatment to come forward with their experiences, and foster an environment that is inclusive and safe for *all* students, professors and staff

women (e.g. *"A woman should be chained to the kitchen sink… but the chain should be long enough to extend to the bedroom."*) • Incidents of sexual violence experienced by female students at the hands of male students • Women afraid to come forward/ speak up about these encounters	• That these messages come from authority figures is particularly dangerous (the reach of their comments is broader, and the legitimacy attached to them greater)	• Assign an individual to monitor the gender dynamics of the department and coordinate/provide (engineering-specific) supports to those facing gender mistreatment • Educate students on the existing sexual violence policy - not only on prohibited behaviour, but also policy scope (e.g., off-campus events) and supports	