I Didn’t Know it was a Thing Either: Women Engineers’ Experience of Suffering in the Workplace

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ABSTRACT

I Didn't Know it was a Thing Either: Women Engineers' Experience of Suffering in the Workplace

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This Canadian study investigates women engineers' lived experiences of suffering in the workplace and aims to contribute to addressing the persistent problem of attracting and retaining women in engineering. It is inspired by my own experience of suffering in the engineering workplace, which I inquire into deeply as part of this thesis in an autoethnographic study. The autoethnography plays an essential role of critical self-reflection in service of this thesis' primary research. My research on women engineers' experience of suffering in the workplace uses a phenomenological, reflective lifeworld approach (Dahlberg et al., 2008). This approach is not widely used in organizational studies because, I argue, it represents a radical paradigm shift that is not easily understood. I endeavor in this thesis to make it more accessible and illuminate its potential to create disruptive, productive knowledge.

For my primary research, I use a purposeful sampling procedure to identify six women engineers who, together, represent a rich variation of experiences of the phenomenon. Each participant provides a critical situation narrative in which they are asked to write a direct, personal account of "a meaningful and vivid memory of an incident in the workplace that contributed to your suffering." They then participate in two in-depth conversational interviews where their experiences of severe and protracted distress are explored. Analysis of women

engineers' intimate, personal experiences of suffering in the workplace found that some women engineers who suffer are trapped in an oppressive, socially constructed reality in which they protect themselves from threats and sacrifice their dignity, self-worth, health, well-being, and job effectiveness. Analysis of my findings against existing research on women in engineering and microaggressions results in six provocative insights. Systemic interventions that acknowledge and address the inequality in engineering are proposed.

ACKNOWLEDGEMENTS

I never dreamed that I would be completing my doctoral studies in the social sciences. Instead, as a young woman and recent graduate of engineering, I dreamed I would be a successful engineer who went on to manage a large group of engineers and maybe even lead a company. Unfortunately, this thesis did not come from a bigger vision for my life or my career. It came from my painful experience and a desire to help reduce the pain of others. It came by putting one foot in front of the other for eight years as I explored my experience and had the privilege to explore the experiences of my participants. I'd like to acknowledge and thank the people who helped and supported me along this unexpected journey.

Dr. Rosemary Reilly, the resilient chair of my supervisory Ph. D. committee, has been a rock steady source of "yes, and." As I made decisions, big and small, along the way, she unfailingly supported me. Her big smile signalled to me that I was onto something special, and her kind-hearted admonition let me know that I needed to be bolder. Dr. James Conklin has been a steady force on my committee. His commitment to rigour has encouraged me to consistently dig deeper. Dr. Gwyneth Edwards was a late addition to my committee and the value of her contribution is hard to put into words. Our common experience in engineering sparked a special learning relationship that buoyed me through to completion.

Behind the scenes, some people generously contributed directly to the research. Psychologist and friend Patty Levell supported my research and was ready to provide mental health support in case one of my participants needed it. Others shared their personal stories of suffering in the workplace with me as I developed the definition of the phenomenon for the study and as I conducted pilot interviews. I could not have done this work without you.

I would like to thank members of Concordia University's Human Systems Intervention (HSI) learning community for their support. Dr. Raye Kass has been a friend and mentor for ten years. Her excitement and curiosity for my research has been a wonderful source of nourishment. In our work together in 680, along with Richard Walling, Louise Pauzé, and all the teaching assistants and interns, I learned the joy of true teamwork. From our students, I learned to be open. Dr. Gilbert Émond very generously created and supervised a course for me. He modelled big-heartedness in teaching. Some very special members of my cohort, Riham Ahmed, Sepideh Alaei, and Carlye Watson, helped me see my strengths and believed in me. My sister, Mary Howard, has become an unexpected colleague in learning and caring confidante.

Unconditional acceptance and joy are the words that come to mind when I think of my dear personal coach, Jan Gregory, who passed away in January of 2021. Many of the memories I share in my autoethnography are ones that we explored together. Its central metaphor of a landmine field came from one of her powerful questions. Now, when good things serendipitously come into my life, I imagine her having a hand in them. May she rest in feminine power.

My family of origin cheered me on throughout and I thank them all for directly supporting my autoethnographic research. While I was a young engineering graduate, my parents witnessed my pain, provided a safety net, and guided me to mental health resources. Each December 6th, my mother connects with me to share our sorrow over the loss of women just like me.

And finally, I want to thank my husband, Paul Troyer, and my children, Katie, Claire, and Peter. Over the years, they have lovingly walked beside me as I've taken this meandering, emotional, and unexpected journey. Together, they encouraged me to "lâches pas."

DEDICATION

To my research participants.

To all women in engineering.

"What would happen if one woman told the truth about her life? The world would split open."

- Muriel Rukeyser

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CHAPTER 1: INTRODUCTION

When I was a young engineering graduate, in one of my first "real" jobs, I experienced suffering in the workplace. Until that time, I had no idea that one could suffer in the workplace – at least not in a modern, professional one in Canada. I had no idea of the debilitating effects of such an experience and its potential detrimental impact on one's mental health. In my experience, when I "stepped out of line," my boss employed an aggressive, intimidating, and backhanded style of questioning my capabilities, challenging my work ethic, and disputing my integrity. However, I neither initially described my experience as "suffering" nor did I attribute it to being a woman in engineering. Outwardly, I simply blamed my jerk of a boss for my intensely painful experience and subsequent struggles to recover. Inside, I felt deeply flawed and as if I was a shell of my former self.

This painful experience sparked a deep curiosity in me about how the social environment at work can profoundly impact an individual. It also gave me a great sense of empathy for people in organizations because I knew first-hand how difficult it could be. As I pursued my career and eventually shifted away from engineering, I was untroubled to leave the profession and never even thought to mourn the loss of my engineering career. I had loved my engineering undergraduate experience and had hopes for a career in which I continued to thrive as I had in university. Instead, my career was marred by the damage inflicted by this painful early experience. As I chose to conduct this research and study women engineers' experiences of suffering in the workplace, I reconnected with my loss and rekindled my love of engineering.[1]

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[1] Throughout this thesis, I use the term "women" in an inclusive way. It includes people who identify as women and who have intersectional experiences.

Perhaps this research began as an effort to heal from my painful experience. In that respect, it was a success as I now "see" my experience differently. Instead of blaming myself, I see my experience through a systemic lens and see my suffering as having manifested as my history and vulnerabilities met my boss' power and dominance within a gendered, engineering culture. As I healed, the research project evolved into a labour of love – for engineering, for the women in engineering, and for those women who have yet to enter the profession. So many years after my own experience, this phenomenon – suffering experienced by women in the context of the engineering workplace – is the focus of my research. I offer it with the hope that it makes a difference.

This thesis describes a Canadian study which aims to contribute to the persistent problem of attracting and retaining women in engineering by investigating women engineers' lived experiences of suffering in the workplace. As I will show, decades of research and interventions into solving this problem have only resulted in marginal gains. Nevertheless, one thing is clear from the existing research: women face systematic disadvantages over their male peers in opportunities to study engineering and in the pursuit of their careers. This study maintains that these systemic disadvantages, however subtle or egregious, can act as a "death by a thousand cuts" and take a painful toll as they accumulate over time. This thesis will describe the research conducted to understand this phenomenon and where I found suffering to be a useful window into the sometimes dangerous, covert dynamics of engineering that help maintain the status quo. And even though the experience of suffering may be a severe outcome, I expect that the covert dynamics uncovered will be relatable to many women engineers.

In this introduction chapter, I will provide sufficient background to the research and frame the remainder of this manuscript-based thesis.[2] First, I will provide three literature reviews: (a) suffering in the workplace, where I will describe the scant literature on this stigmatized topic; (b) women in engineering, where I will provide a summary of the relevant research; and (c) microaggressions, a well-studied phenomenon that I determined closely relates to suffering in the workplace. These literature reviews each serve different purposes, as I describe below. Next, I will introduce the objective of this research and, finally, the organization of this thesis.

Literature Reviews

The focus of this research lies at the intersection of three areas of study: suffering in the workplace, women in engineering, and microaggressions. The purpose of the literature review of the first area, suffering in the workplace, is to provide a survey of the state of knowledge and position this research within it. This literature review was done prior to the research to confirm the gap in the research and to help develop the definition for suffering in the workplace that would be used.

The purpose of the literature review of the second area, women in engineering is multifaceted: (a) to describe the context in which the suffering is experienced, (b) to demonstrate the relevance of focusing on suffering in this context, and (c) to provide a sufficient foundation of knowledge so that the detailed analysis of my findings and links to existing research in Chapter 5 in this area are understood in a broader context. This literature review was only

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[2] A manuscript-based thesis is a thesis format which includes a collection of manuscripts that are published or are intended to be published.

partially done prior to the research to support the argument in the thesis proposal that women engineers' experience of suffering in the workplace was worthwhile. Consistent with the reflective lifeworld research methodology that I used (Dahlberg et al., 2008), the bulk of this review was done after the findings were established to avoid having it unduly influence the research findings.

The purpose of the literature review of the third area of study, microaggressions, is also to ensure that the detailed analysis in Chapter 5 in this area is sufficiently grounded. Although I had a general sense of what microaggressions are and their hidden dynamics before starting the research, this literature review was done entirely after the completion of the study. This was because I did not expect microaggressions to be so relevant to my findings. As I will demonstrate in Chapter 5, as I made links from my findings to existing theory, the dynamics of microaggressions surfaced as vital to my understanding of my participants' experience of suffering in the workplace.

Suffering in the Workplace

Although most of the suffering experienced in the workplace is hidden (Frost, 1999), over the years, researchers have tended to focus on suffering that is visible. As a result, there is little research on suffering in the workplace, especially that which is covert.[3] However, this trend

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[3] A search in the Web of Science citation index (core database) on May 17, 2022 on the topic of "suffering" in the category of "Management" found 2,564 citations. However, a filter of these citations by "relevance" and "times cited" found this number to be highly inflated because the word "suffering" is often used in a colloquial manner and not meant as the focus of the research or as a theoretical construct. Relevant articles that were found are cited in this paper.

may be shifting due to what seems to be a spark of interest due to the visibility of suffering in the workplace due to the COVID-19 pandemic (e.g., Butterick & Charlwood, 2021; Lage & Rodrigues, 2021; Simpson et al., 2021; Wee et al., 2021; Yuan et al., 2021; Yue & Cowling, 2021). Time will tell if this interest is sustained.

In looking at the research as a whole, I found that many researchers assume that suffering in the workplace is a given but do not define it clearly nor study it directly. This seems to be the case for those who study compassion (e.g., Bolton & Laaser, 2021; Dodson & Heng, 2022; Driver, 2007; Dutton et al., 2002; Frost, 1999; Frost et al., 2000; Hopfl & Linstead, 1993; Kanov et al., 2017; Kanov, 2021), critical management theory (e.g., Alvesson & Willmott, 2012; Dashtipour & Vidaillet, 2017; Gill, 2019; Heaphy et al., 2022), and the psychodynamics of work (Dejours, 2006). Without clearly describing suffering, Kanov et al. (2017) claims that suffering in the workplace is ubiquitous, perhaps suggesting that pain and suffering are equivalent. Again without defining it, some researchers equate suffering with anxiety, depression, and job stress (e.g., Allard-Poesi & Hollet-Haudebert, 2017, Cole & Carlin, 2009; Devenish-Meares, 2018; Hemberg, 2017; Loriol, 2019).

Many studies that study suffering in the workplace directly tend to not acknowledge the suffering hidden in everyday work (Frost, 1999). Instead, they direct their attention to suffering that is visible or legitimate to discuss (Marshak, 2006). Notably in the field of nursing, researchers focus on the suffering of medical staff as they tend to the suffering of their patients (e.g., Cole & Carlin, 2009; Eifried, 2003; Honkavuo & Lindström, 2014; Huang et al., 2020; Mok et al., 2020; Rowe, 2003; Rudolfsson & Flensner, 2012; Vogus et al., 2021). More generally, research on suffering in the workplace tends to focus on catastrophic loss. Example studies focus on job loss (Morse, 2000; Stein, 2001), working while grieving (Nordgren et al.,

2011), and traumatic incidents (Dutton et al., 2002; Tehrani, 1998). Emphasis on such visible suffering may reflect mainstream management researchers' tacit belief that suffering either does not exist or, without a "legitimate" cause, is the result of personal weakness. Charmaz (1999) asserts suffering rouses moral judgment from others depending on the attribution of blame. For example, suffering caused by being laid off in a plant closure might provoke a high, righteous status while not being able to handle job pressures might provoke blame and a low shameful status. According to Frost (20003), to openly express one's suffering at work involves the threat of being perceived as weak. This could be particularly threatening to men, for whom weakness is a powerful shame trigger (Brown, 2012).

Another notable association with suffering is *burnout*. Burnout is an individual construct characterized by exhaustion, cynicism, and inefficacy (Maslach et al., 2001) that is equated with suffering in the workplace. (e.g., Cole & Carlin, 2009; Devenish-Meares, 2018; Hemberg, 2017; Loriol, 2019). In their U.S. study, Shanafelt et al.'s (2012) concluded that a significant proportion of their research participants experienced symptoms of burnout (37.9% of physicians and 27.8% of working adults). Unfortunately, due to its focus on the pathology of workers, "we tend to think of burnout as an individual problem" (Moss, 2019, para. 1) which may contribute to the belief that those who suffer are weak.

Critical management scholars have been trying to sound the alarm that the oppressive nature of organization cause employee suffering.[4] However, as my literature review demonstrates, there seems to be resistance among management researchers to the idea that

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[4] For those wanting additional understanding of critical management theory, see Alvesson and Willmott (2012).

suffering is hidden in everyday, ordinary work (Frost, 1999). Instead, they seem to downplay it while emphasizing visible, "legitimate" suffering. This tendency to avoid everyday suffering helps maintain the status quo by neglecting systemic, hidden forces in organizations (Hudson & Okhuysen, 2013). In contrast, this study intends to inquire into the experience of suffering without blame to discover what is hidden in suffering in the workplace, including oppressive, systemic forces.

Women in Engineering

In this literature review, I first describe what engineering is.[5] This fundamental knowledge is important because it sets the foundation for understanding the unique context in which women engineers suffer. Next, I describe engineering's white, heteronormative, male-dominated history which provides some essential background to the current context. Then, I broadly describe women engineers' general experience of the "leaky pipeline" (Faulkner, 2009a, p. 15), a metaphor that is commonly used to describe the (short) supply of women engineers and their disproportionate exit from the profession as they progress along their careers. I will then describe engineering culture in relation to women in engineering. Where the literature describes the engineering culture from a gendered perspective, it is important to note that it often neglects intersectional experiences of traditionally minoritized people. I have tried to augment it by

[5] Where available, Canadian data and studies will be referenced. However, since the research is sparce and given the similar, stubborn trends in women's participation in engineering in other Western countries, studies from other Western countries are referenced and included in the analysis.

including research that reflects intersectional experiences. Finally, I will shift to describing how women engineers respond and cope within the culture.

In reviewing the literature, and like Tonso (2007), I take the view that women are underrepresented in engineering because the environment disadvantages them. As I will discuss, I think of engineering's connection with masculinity as socially constructed and reject the idea that women are inherently not interested in engineering or that they are, by virtue of their sex or gender, not suited for engineering. As Evetts (1998) found, the work of engineering isn't too hard for women - it's the social environment or culture that's too hard for many.

Before I continue, it is also important to recognize the breadth of engineering. With low public awareness of what engineering is and what engineers do (Engineers Canada, 2017; McIlwee & Robinson, 1992), engineering tends to have a mythical quality with harmful stereotypes of who belongs and who does not. In summarizing the literature in this area, much of which is based on narrow sets of participants (e.g., from one undergraduate program, from three organizations, etc.), there is a risk of reducing engineering to a monolithic profession and seeing it as a caricature of itself. For example, there is a stereotype in engineering that engineers are socially incompetent, which Faulkner (2006) dispels. "*Real engineers bear very little resemblance to the stereotypes of them*" (p. 5). In addition, by focusing on engineering as the context for women engineers' experiences of suffering, there is a risk that women's experiences of engineering are oversimplified and that other non-dominant groups' experiences are overshadowed. While I do my best to mitigate these risks, I invite readers to remain open to the complex and evolving nature of the experiences in the profession.

What is Engineering?

Engineers draw on scientific knowledge from a wide variety of disciplines to design and implement practical solutions for society, often balancing constraints and standards such as cost, schedule, quality, and safety (Encyclopedia Britannica, n.d.). Early engineering disciplines include civil engineering (which focuses on structures and infrastructures), mechanical engineering (which focuses on machines that convert energy, manufacture products, and transport people and goods), electrical engineering (which focuses on electronics and power distribution), and chemical engineering (which focuses on production of chemical processes). These engineering specialties rely primarily on the application of scientific principles from mathematics, physics, and chemistry. Engineering involves a wide variety of applications in society and tends to demand general problem-solving skills and collaboration (Dryburgh, 1999).

In more recent years, a variety of new disciplines have emerged, including environmental engineering (derived from civil engineering, with a focus on water and waste infrastructure and sustainability), software engineering (derived from electrical engineering, with a focus on software solutions), and biosystems engineering (where engineering principles are applied to plants, animals, and humans). Enrolment trends by engineering discipline vary considerably by gender. For example, 50.2% of students studying biosystems engineering in 2019 were women compared to 15.6% in software engineering (Engineers Canada, 2020a). However, it is not clear why there is such a range. Some assert that women tend to value social responsibility more than their male peers and choose their discipline accordingly (Cech, 2014; Seron et al., 2016). In one study, engineering professors reinforced stereotypes of women as they explained why women students are attracted disproportionately to various engineering disciplines (Blosser, 2017).

In Canada, engineering is a provincially and territorially regulated profession (Engineers Canada, n.d.-a). To call oneself an engineer and practice engineering, one must obtain an engineering undergraduate degree from an accredited university and practice under the supervision of a professional engineer for a period defined by the regulator, although engineering graduates also perform engineering work that is not regulated.[6] Upon graduation from engineering, new graduates are invited to "the ritual calling of an engineer," a ceremony where graduates are welcomed into the profession by more senior engineers (Corporation of the Seven Wardens, 2020). At the ceremony, the graduate is given an "iron ring," meant to be worn on the pinky finger of their writing hand, that symbolizes their responsibility to society.

Engineering's Male-Dominated History

Engineering is considered the most male-dominated of all professions (McIlwee & Robinson, 1992) and its "sheer 'weight of history'" (Faulkner, 2011, p. 289) influences women in engineering today. In the late 1800s, as the population and the demand for more complex machinery and infrastructure increased, engineering shifted from a craft learned on the job to one requiring formal education (Frehill, 2004). At the beginning of the twentieth century, a bifurcation took place that established the notion of "real" engineering work, performed by men (Oldenziel, 1999). Engineering coalesced into a profession out of the desire for the same respectability given to other professionals, including doctors and lawyers, while paraengineering

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[6] Researchers tend not to mention whether their use of the term *engineer* reflects the regulated use of the title. In my study's case, the inclusion criteria for participants included that they are graduates from an accredited engineering program in Canada and working in the engineering profession. It did not include that they are a member of a regulating body.

work (e.g., drafting, calculating, etc.) that was typically done by women and minorities was excluded. Songs and jokes also sprung up at this time and reinforced the white, heteronormative, masculine nature of engineering (Oldenziel, 1999). According to Freehill (2004), attrition in engineering schools was high but was not seen as a problem. Instead, it was seen as a way of weeding out the weak and a source of pride for those who passed this "test of manhood" (p. 399). The engineer as a man has been a persistent image since these early days (Faulkner, 2000a; McIlwee & Robinson, 1992; Phipps, 2002).

Elsie MacGill was the first woman to practice as an engineer in Canada in 1927 (Sissons, 2021). Despite this early milestone, less than 2% of students enrolled in undergraduate engineering programs were women by 1970 (Statistics Canada, n.d.). These women students faced a hostile, misogynistic environment. Dryburgh's (1999) review of yearbooks and student newspapers from the 1970s at one engineering undergraduate program in Canada found evidence of a masculine "play hard" (p. 677) engineering culture that was anti-woman and (closely related) anti-"artsy." The publications abounded with pornographic depictions of the engineer's male sexual success over women and their relative prowess compared to their arts and science counterparts.[7] In industry at the time, Hacker (1981) and Phipps (2002) found that women and sex were used to "sell" engineering, whether in advertising campaigns or at trade shows.

In one of the earliest studies on the culture of engineering and women, Hacker (1981) interviewed faculty at one U.S. university and found they valued what they considered masculine rationality over feminine qualities (as Faulkner (2000b) also did). She also found, in her

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[7] In my experience as an undergraduate in engineering in Canada, these anti-women, anti-artsy expressions persisted into at least the late 1980s.

observations in the classroom, that this hierarchy was perpetuated through faculty's derisive jokes. Her analysis of the jokes found that they most often denigrated technical incompetence (what Hatmaker (2013) later claims is a key aspect of engineering identity) and elevated engineers over others with less status, especially women. McIlwee and Robinson (1992) also found that women studying engineering faced resentment and hostility.

In 1989, just two years after women surpassed men in overall university enrolment (Association of Universities and Colleges of Canada, 2011), only 13% of people enrolled in engineering were women (University of Waterloo, 2014). That same year, a gunman murdered 14 women as he targeted women engineering students at École Polytechnique in Montreal and denounced them as feminists. Under unimaginable duress, one survivor recalled replying, "We're not feminists, we're girls who like science" (Boileau, 2020, p. 26). This horrific event sent shock waves through the country and intensified efforts to make the profession more inclusive to women.

Despite the general acceptance of women in engineering and their success in the field, Dryburgh (1999) found evidence of overt misogyny in engineering chants in 1996. As recently as 2014, engineering students at a Canadian university were suspended over the circulation of a songbook rife with "sexist, violent, and degrading material" (Chapman & Ruf, 2014, para. 1). Today, diluted versions of engineering chants, with a verse added for women engineers and another entitled "politically correct," still exist on university websites (e.g., Waterloo Engineering Society, n.d.) as trace evidence of the deep, historical roots of male domination in engineering.

Women in Engineering Today

Attracting and retaining women in engineering remains a persistent problem and women continue to make up the small minority in engineering in Canada. Since a swell of women's participation in the profession in the 1970s and 1980s, gains have been slow, stubbornly lagging other professions in which women have made significant inroads (Andres & Adamuti-Trache, 2007). Today, despite much research and intervention, women make up 24.2% of engineering graduates in Canada in 2020 (Engineers Canada, 2020b) and 14.2% of practicing engineers in 2020 (Engineers Canada, 2021). Once practicing in the field, women engineers experience more burnout than their male counterparts (Hall et al., 2015; Ronen & Pines, 2008) and leave for other fields at a higher rate (Hunt, 2016; Ranson, 2003) in what is often referred to as a leaky pipeline of women in engineering.

Women in the Engineering Pipeline

Unfortunately and broadly speaking, aside from disappointingly few more women entering the engineering pipeline, not much has changed since McIlwee and Robinson (1992) conducted their landmark, comprehensive study on women in engineering.[8] They found women's early socialization tends to insulate them from experiences (e.g., to study math, to tinker, to be encouraged to pursue the profession, to see themselves as an engineer) which systematically disadvantages them in comparison to their male counterparts.

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[8] Their U.S. study included 406 participants who were mechanical and electrical engineers with up to 10 years of experience since graduation. All participants completed an eight-page questionnaire. Of those, 82 participants (30 men and 52 women) took part in a follow-up interview.

Women enter the pipeline for the same reasons as men, including their proficiency in science and math and their attraction to a clear path to a career (Faulkner, 2006; Gill et al., 2008; McIlwee and Robinson, 1992; Seron et al., 2016). Once in university, they tend to persist (Lord et al., 2009). McIlwee and Robinson (1992) found that women tend to overcome any bias or hostility and thrive academically (which keeps their insecurities about their hands-on competence at bay). Dryburgh (1999) also found that women succeed academically but saw this "success" not so much as overcoming the environment but of being socialized into the masculine culture while covering any anxiety with an appearance of confidence.

When they enter the workplace, their place in the pipeline becomes more precarious (Faulkner, 2006; McIlwee & Robinson, 1992). Their acceptance as "real" engineers is "more fragile than men's" (Faulkner, 2006, p. 10). While men and women enter the profession with similar starting points and enthusiasm for their work, women tend to not progress as quickly as men. Their academic success no longer protects them from strong engineering cultures (McIlwee & Robinson, 1992). Ironically, when the early bifurcation of engineering excluded women and hands-on work from the profession, its rationale remained an important cultural value that also serves to exclude women from the profession. Despite the male-dominated history of engineering, many women who stay in the pipeline report enjoying their work and doing relatively well (Evetts, 1998; Faulkner, 2009a; Gill et al., 2008, Ranson, 2005). However, as mentioned earlier, they leave the profession at a higher rate than men and experience more burnout than their male counterparts. They also disproportionately shift to roles that are seen as more feminine (management, human resources) and less technical (McIlwee & Robinson, 1992).

Jongenson (2002), in her study of identity formation of women engineers found five aspects to their identity as they advance through the pipeline. First, they have a special and

unique relationship with their engineering career. They see themselves as especially skilled at math and science and uniquely curious in the physical world around them, an identity that Gill et al. (2008) found helps them to feel as if they belong. Second, Jorgenson (2002) found they are proud of their ability to navigate the male-dominated engineering workplace and downplay any vulnerability or doubt. In this respect, they differentiate themselves from other women who don't navigate it as successfully. Third, they position themselves as non-feminist or the profession as gender neutral. They tend to reject any special treatment and attribute any incidents of sexism to individuals. Fourth, they consider themselves to be good mothers but painfully concede that, as one participant summed up their dilemma, they cannot simultaneously be "the perfect mother and the perfect engineer" (p. 370). This resignation reflects their acceptance of what they consider to be a "natural" and immutable aspect of the profession, a finding consistent with Faulkner (2009b). Finally, they do not want to be considered part of a homogenous group of women engineers who share patterned, discriminatory experiences. Together, these aspects of their identity suggest that it includes a denial and maintenance of the systemic nature of the leaky pipeline.

The Engineering Culture

As alluded to, scholars have consistently found the engineering culture to be masculine, although what constitutes "culture" is not always clearly defined.[9] Hacker's (1981) early study

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[9] The term *masculine* is often used by scholars to characterize the engineering culture and is problematic. It suggests that gender is binary, with innate, masculine qualities of men (in contrast to innate, feminine qualities of women), rather than the product of socialization (Lorber, 2008).

found the engineering culture at one university department was characterized primarily by the "male-linked mind superior to a female-linked body" (p. 343). McIlwee and Robinson (1992) went a step further and claimed that the stronger the "masculine" engineering culture, the more poorly women do in the profession. Since then, others have found evidence that agrees that women are disadvantaged by the engineering culture (e.g., Evetts, 1998; Seron et al., 2016). Here, while acknowledging that engineering culture is not uniform (Faulkner, 2009a; McIlwee & Robinson, 1992), I review what have been found as characteristics of the masculine engineering culture.

Hacker (1981) conducted the first known study to inquire into the engineering culture from a gendered perspective. She found that male faculty and students at one U.S. university, in contrast to their social science peers, valued rationality, structure, and technical knowhow (what they considered masculine traits) over social competence (what they considered a feminine trait). They preferred concrete, solvable problems over unpredictable emotions. They respected the mind and demeaned the body. They valued hierarchy and saw themselves as superior to others who were less rationale (including women). These others were the targets of their frequent, belittling jokes.

McIlwee and Robinson's (1992) study of early career engineers in the U.S. found that engineers highly value technical competence, hands-on experience, and the centrality of engineering to a company's functioning. In addition, they found that engineers had a prescribed way of behaving at work that was masculine and focused on hands-on competence. "To be taken as an engineer is to look like an engineer, talk like an engineer, and act like an engineer. In most workplaces, this means looking, talking, and acting male" (p. 21). They found that the more

power engineering had (as a department) within a company, the stronger the engineering culture and the more difficult it was for women to progress.

Dryburgh (1999) studied the engineering culture of one undergraduate program in Canada. She found a culture dominated by working hard and playing hard, where women consistently had to expend more energy than men to fit in. On the work side, students were socialized to initially display (and later internalize) confidence while masking any self-doubt about their abilities. In addition, all students displayed cohesion among fellow students and the iron ring ceremony reinforced this solidarity. For women, this meant denying sexism and attributing any experiences of sexism to individual exception. On the play side, she found that norms had evolved over the previous 25 years as society changed. In the 1970s, the play hard culture was one of sexist, homophobic, and racist, masculine virility displayed in student newspapers and yearbooks with pornographic images. This play hard, masculine identity was often in contrast to what engineers considered the weaker artsy student. Although women across the university protested, women engineering students supported it explicitly and some joined in by adopting the virile woman engineer image. With outside pressure, the play hard culture eventually evolved to a beer drinking, partying image. Although women did not always participate, it was important for them not to object to the culture or, in other words, to not be a threat.

Tonso (2007) found that words that engineering students used to describe engineering identities (e.g., nerd, computer whiz, etc.) did not, for the most part, apply to women engineers, suggesting their "otherness." When they did apply to women, the terms often reflected negative stereotypes of women, implying their lower status. In her study, she found that there was a well-known, long-standing, denigrating term for women student engineers at the school under study,

namely “PES-Woman.” The researcher sums up this meaning-loaded term, “women student engineers were constructed as deficiently women if they were successful engineers and deficiently engineers if they were successful women” (p. 230).

More recently, Faulkner (2009a) observed and interviewed engineers in three U.S. companies (five worksites) and found mixed results with respectful, inclusive behaviours and gendered, exclusive behaviours. She found that everyday interactions were largely respectful and work focused. However, subtle routine acts excluded women (e.g., referring to all engineers as “he,” men,” or “boys,” men shaking hands only with other men). Polite exchanges between men and women tended to take place but contrasted with easier, more casual relationships between men. Informal conversations among colleagues tended to be inclusive but conversations with vendors or clients tended to be male centered, with all engineers fluidly adapting to safe, gendered topics. Playful, but belittling (including homophobic), jokes or ribbing were often observed. However, she also found that there was a wide range of cultures within the three companies she studied. In contrast to the software development and building design offices, the oil field management office tended to use aggressive styles of communicating and their jokes moved into deep sexist, racist, and homophobic territory. Also in contrast in the different work sites was engineers’ willingness to speak up. For example, she found that one software engineer spoke up when she found something offensive, while engineers in the oil fields learned to tolerate offensive behaviour. In this way, the environments under study were found to “accommodate a range of masculinities” (p. 15) that, to varying degrees, make it difficult for women (and others in non-dominant groups) to fit in.

Male et al. (2018) studied students’ experiences of engineering workplace culture in Australia (9 women and 4 men) and found that, while they described worthwhile experiences,

they also experienced a gendered culture. They found incidents that were demeaning to women, where attention was uncomfortably called to their gender, where gender expectations were imposed, and where women's interests were looked down upon. Like Faulkner (2009a), they found the culture offsite (as opposed to an office environment) to be rough and there was a lack of respect from technicians and tradespeople towards the students. The researchers postulated that, together, these features were more taxing on women because of the energy they expended to cope. Further, they found that the demands of the engineering culture did not support a balance between work and family life. Finally, they found that students were reluctant to reach out for support, often because they blamed themselves for not being tough enough.

Beddoes (2021), in her study of early career engineers' experience of engineering organizational socialization, found a culture where largely invisible *privileges* are afforded to the dominant group (white males) and not others. She defines privileges as "systemic, unearned advantages that accrue to individuals because they belong to certain groups" (p. 161). She found engineers not in the dominant group were not afforded privileges to varying degrees based on their intersecting identities. They included the privilege to be assumed as competent, the privilege to not be sexually harassed, and the privilege to a sense of belonging or feeling welcome.

Together, these studies, which took place over a span of 40 years, in both academic and work settings, paint a picture of engineering as a field dominated by white, heterosexual men that systematically disadvantages others, including women. Although the culture has evolved, and overt acts of marginalization have been largely forced out of organizations, covert marginalization persists:

> Most of the barriers that persist today are insidious – a revolution couldn't find them to blast away. Rather, gender discrimination now is so deeply embedded in organizational life as to be virtually indiscernible. Even the women who feel its impact are often hard-pressed to know what hit them. (Meyerson and Fletcher, 2000, p. 127)

I now shift to how women engineers cope with and respond to the gendered engineering culture.

Women's Response to the Engineering Culture

As I have shown, the engineering culture, though it varies across contexts, disadvantages women systemically. Here, I discuss women's response to engineering culture. Numerous studies have been done to understand how women cope individually with the gendered engineering culture, as I discuss here. I also introduce how women with intersecting marginalized identities experience and cope with the engineering culture. Then, I focus on one coping strategy in particular, the denial of sexism in engineering, to illustrate one way that women reproduce the masculine culture. Together, the literature on women engineers' coping strategies is remarkably consistent, and point almost exclusively to strategies to survive, rather than strategies to understand and change systemic issues. Even when studies focus on women's success and persistence in the field, they find women exceptionally identified with engineering, highly motivated, and well adapted to the male-dominated culture (Buse et al., 2013). Others focus on support in navigating the gendered culture and playing by the rules (e.g., Fernando et al. 2018; Schmitt, 2021).

On the broadest level, the image of engineering as masculine dissuades women from pursuing the profession at all (Faulkner, 2006; McIllwee & Robinson, 1992; Phipps, 2002).[10] Once in university, stereotypes of engineers and institutional climate disproportionately contribute to attrition of women engineering students (Kuley et al., 2015). Comments and reactions from colleagues and associates remind women that being a man in engineering is natural and being a woman is unusual (Faulkner, 2009b; Hatmaker, 2013; Phipps, 2002). Even using the descriptor *women* to describe this population (as I do here) implies they are not the norm (Hatmaker, 2013).

Coping Strategies. At the more specific level, researchers have found an array of individual coping strategies that women engineers use that were learned in a process of enculturation and professionalization into the profession (Dryburgh, 1999; Powell et al., 2009; Rhoton, 2011). One might summarize these strategies as a way of managing being both women and engineers because, it seems, women engineers cannot be fully both (Faulkner, 2011).

Hatmaker (2013) researched women engineers in the U.S. and found that they cope with four forms of marginalization with various impression management tactics. Those forms of marginalization include: (a) *amplifying*, where comments call attention to their gender; (b) *imposing gender expectations*, where women are expected to behave in traditionally feminine ways or do tasks traditionally done by women; (c) *tuning out*, where women are neither heard nor ignored; and (d) *doubting technical abilities*, where their technical competence is questioned

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[10] Faulkner (2006) found that the masculine image of engineering also dissuades some men from entering the profession, implying it is because they do not fit the masculine stereotype of engineers.

by default. In response, she found that women engineers employ various strategies to manage their identity. They responded to amplifying, tuning out, and doubting technical abilities by trying to transform perceptions of them from women to engineers (e.g., projecting confidence, focusing on the work, downplaying their femininity). They responded to tuning out and doubting technical abilities by proving themselves. They worked hard to build their reputations and to be taken seriously. They armoured up for meetings with extra preparation and data in anticipation of questions. They also pre-empted any doubts in their abilities by offering their credentials. They responded to imposing gender expectations and amplifying by bluntly interrupting any interaction in which their gender becomes an issue or by rationalizing not interrupting it. Overall, they found that these experiences of negotiating their identity caused them to (a) devalue themselves as engineers if their efforts to manage the marginalization failed, (b) feel ambivalent (both bothered and realistic), or more positively (c) feel a sense of belonging when their steady efforts to prove themselves resulted in recognition of their expertise or others simply treating them "as a person" (p. 393).

Male et al.'s (2018) study of students in Australia doing their work terms found similar forms of coping strategies as Hatmaker (2013). Like Hatmaker (2013) found, many of the students tolerated the environment and adapted to it. In addition, one left the work term after making a complaint while another reported inappropriate behaviour and was retaliated against. As I write this, I notice the words researchers like myself use can serve to gloss over depth of experience and how important it is to stay close to the data. For example, the word "retaliation" is vague, and the participant's words are more effective in conveying the threatening nature of the environment. Male et al. (2018) quote one woman student who, after reporting inappropriate conduct, was leaning over the printer when her colleague passed by and said, "oh wouldn't you

like to rape her" (p. 371). This difference between the language academics use and participants use highlights the need to stay close to the data if we are to develop sensitive and useful results and recommendations.

Evetts (1998) found three strategies that women use to cope with gender relations in engineering in the United Kingdom: (a) play along and throw jokes and inappropriate comments back at the men, (b) tolerate and submit to the gendered culture, and the preferred approach (c) "work extra hard" (p. 289) to earn respect for their technical competence. The study participants' perception of the gendered culture ranged, with some denying any difficultly and others experiencing overt sexual harassment.

In Canada, Dryburgh (1999) found three main strategies women engineering students use to cope with the male-dominated engineering culture at one university. She found that they accept and don't criticize the masculine culture. They also use *impression management*, a strategy that involves performing in social situations to elicit a desired reaction from others (Goffman, 1959), to convey that they are "one of them" and are not a threat to the culture. Finally, they deny sexism in engineering and rationalize any sexist behaviour as exceptional.

Khilji and Pumroy (2019) take a different approach and inquire into how women engineers in the U.S. successfully overcome career barriers in the workplace to "shed light on their strength and resilience" (p. 1033). As described already, they found women faced gendered norms, covert discrimination, and difficulty maintaining work-life balance. In addition, they found that the women tend to experience a "squiggly line" (p. 1044) career path versus a straight-line career path, including difficulty getting "hard-core" (p. 1041) engineering jobs and their diversion to "pink-collar" (p. 1041) jobs, including project management. To manage the gendered norms and covert discrimination, women credited their "tough skin" (p. 1043). In

addition, they garnered support from other women, were mentored, and found women's professional networks helpful, findings that contradict other anti-women coping strategies. They expressed great pride in making it in a man's world and enjoyed the recognition that gave them. To cope with the non-linear career paths, some women downgraded their expectations and changed their priorities. They found women under "extreme pressure to have it 'all'" (p. 1045) and having to make "*tough life and career choices*" (p. 1042) depending on their partners' support at home.

Ranson (2005) found women engineers worked hard to be seen as "one of the boys" and found that women distanced themselves from women who did not follow the unspoken rules. Powell et al. (2009) agree and also found women engineering students adopted an "anti-woman" (p. 420) stance as a way of distancing themselves from their identity. Similarly, Rhoton's (2011) study of women in science, technology, engineering, and mathematics (STEM) found that they use anti-women coping mechanisms that reproduce gender barriers in a male-dominated environment. Specifically, she found that women in STEM tend to distance themselves from other women in STEM who displayed femininity, engaged in feminine practices, and named structural sexism as a problem. Generally, they saw engineering as a gender-neutral meritocracy and, paradoxically, expressed pride in their abilities to overcome their feminine socialization and succeed in a male-dominated environment.

Ranson (2005) examines women engineers' self-image as "one of the boys," and focuses on a point in women's lives when their engineering identity is called into question: when they consider motherhood or become a mother. Many who had children took the opportunity to re-evaluate and down-shift their career while denying the change was related to the difficulty in

sustaining their protective self-image. Contemplating or meeting this life milestone seems to destabilize their ability to manage their identities as both women and as engineers.

Intersectional Experiences and Coping. So far, the studies presented have addressed women's experiences in general, without mention of women with intersectional experiences. With a broad brush, one can say that these studies predominantly reflect white women's experiences and neglect the experiences of people whose identities as women intersect with other traditionally minoritized identities, a conclusion supported by Bagilhole et al. (2008). However, Slaton's (2015) asserts that marginalization based on identity is routine in U.S. engineering education, whether overt or subtle. In addition to the intersectional research presented on microaggressions below, the following studies show that women with intersecting identities tend to experience compounding barriers to engineering.

Slaton (2015) asserts that engineering's perceived positive characteristics (e.g., white, male, heterosexual) make it difficult for those who don't possess these characteristics to succeed. One example of systemic racism in U.S. engineering education is the recognition that racialized students who came from under-performing high schools are disadvantaged coupled with the reluctance to have additional programs to support them out of fear that their institution's reputation may suffer. She adds that the technical focus of engineering education and, by extension, the lack of reflection on its social aspects prevent engineering education from achieving equity.

Gibson and Espino's (2016) research addresses the understudied experiences of Black women engineering students, where, in the U.S., only 1.3% of students enrolled in engineering are African American women (National Science Foundation, 2009). They inquired into how such students understood their race and gender identities within their university's engineering culture.

First, their experiences were flush with expectations and stereotypes of them from fellow students and they adjusted their behaviour to dispel assumptions. The participants were assumed to be too feminine, too angry, and not prepared for the academic demands of engineering. They experienced others having low expectations of them and of having to prove themselves, particularly in group work. As Black women, they felt pressure to represent being both a woman and a Black person well and valued being role models and mentors for young Black women.

Ross et al. (2020) acknowledge that the small numbers of Black women in engineering results in their neglect in research. In their study, the researchers sought to understand Black women's longevity in the engineering profession by interviewing those who have been in the profession for more than 10 years. Drawing on social identity theory, the researchers found that Black women engineers who persisted in the profession found a way to navigate their identities as Black, women, engineers. They credited supportive spaces, such as Black professional organizations and historically Black colleges and universities, to their ability to negotiate and form their own identities in a profession where they are not the norm.

Lord et al.'s (2009) U.S. study examined the rates of persistence among women engineering students in comparison to men, including students who identify as Asian, Black, Hispanic, Native American, and white. Their quantitative study found that, with the exception of Native American women, women tend to persist at the same rate as their male peers. Their study calls for more research on differences in experiences for race and gender.

Cech and Waidzunas (2011) studied how lesbian, gay, and bisexual (LGB) identifying engineering students in the U.S. cope with the heteronormative engineering culture.[11] They found that LGB identifying students experienced a hostile environment which burdened and isolated them both emotionally and academically. They encountered general anti-gay bias and anti-gay comments couched in technical, engineering language. While students, they coped by using three main strategies: (a) by "passing" as heterosexual, (b) by downplaying aspects of their LGB identity, and (c) by performing so strong academically that others want to do group work with them. In addition, as they anticipated entering the profession, they were anxious about the possibility of shifting to an even more hostile environment.

Denial of Sexism. Although mentioned previously, the denial of sexism in engineering is one coping strategy that merits highlighting because of its stark contrast to the evidence and its powerful impact on maintaining the status quo. Numerous studies have found that women engineers tend to think of engineering as gender neutral (Dryburgh, 1999; Franzway et al., 2009: Jorgenson, 2002; Rhoton, 2011; Seron et al., 2018). As Jorgenson (2002) found, participants tended to believe that "being a woman was largely irrelevant to their treatment by fellow engineers and by managers" (p. 367). One way that this denial manifests is that women acknowledge that they experience sexist behaviour "providing clear and strong criticisms" (Seron et al., 2018, p. 1) but frame their experiences as individual acts and not part of a broader system of marginalization in the profession. Ranson (2005) also found that women engineers

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[11] "LGB" does not reflect all the identities that exist outside of Western understandings of gender and sexuality. However, I used this acronym because it is what the researchers used at the time.

tend to minimize even overt acts of sexism. Women engineers also adopt engineering's ideologies of individualism and meritocracy and reject any strategies that might provide women an "advantage" (Seron et al., 2018). In addition, women engineers, with excellent math and science skills, think of themselves as exceptional and link their success with their individual abilities and willingness to overcome obstacles (Seron et al., 2018).

Gill et al. (2008) provide some additional context to the denial of sexism. As with Faulkner (2011), they found that women engineers constantly negotiated between their identities as women and as engineers. In adopting more feminine identities, the women tended to be accepted as daughters, wives, or mothers to their colleagues while compromising their professional identity. In adopting more masculine identities, they received legitimacy as engineers while denying aspects of themselves. Either way, the women denied sexism and neither of their choices disturbed the status quo of power relations (Gill et al., 2008). Confronting the problem, their participants said, was exhausting.

Dryburgh (1999) suggests that women engineering students' denial of sexism maintains the solidarity with their male counterparts and preserves women's non-threatening status. Powell et al. (2008) found that it serves as a coping mechanism and protects them from alienation. More generally, Schmitt et al. (2003) suggest that acts of sexism are often ambiguous and, when in doubt, women tend to minimize or dismiss them. In addition, they argue that the more women perceive themselves as systematically discriminated against, the less control they perceive they have, and the more psychological distress they experience.

In their study of the engineering culture and why there are persistently so few women in engineering, Franzway et al. (2009) stumbled on a puzzling trend that led to further insight about the belief that engineering is gender neutral. Specifically, they found a surprising number of men

and women engineers could not explain why there are so few women in engineering while simultaneously denying that gender is relevant to the work or culture of engineering. Surmising that this collective not knowing is a key part of the problem, they argue that ignorance is produced and maintained through sexual politics, where the dynamics of power in gender relations advantage men while making their advantage invisible.

Together, these barriers and coping strategies describe an environment where women engineers work harder than their male peers to belong and succeed in the profession. With rare exception, their individual coping strategies "fail to question, let alone challenge the status quo" (Powell et al., 2009, p. 421). Male et al. (2008) included two examples of individual coping strategies that attempted to influence change. However, in both cases, the women experienced a loss, with one exiting her student work term and the other experiencing retaliation. Throughout my literature review, I found no evidence of individual coping strategies that have succeeded in changing the culture. In addition, none of the literature on women in engineering that I reviewed examines the impact of the masculine culture of engineering nor the resulting coping strategies on women engineers' wellbeing. One additional area of research, *microaggressions*, sheds some light on this "stuckness" and the impact of the engineering context on women's wellbeing.

Microaggressions

As will be discussed in Chapter 3, the metaphor of suffering as a "death by a thousand cuts" was useful for planning the data collection. However, I only had a superficial understanding of microaggressions. Once I established my findings in Chapter 4 and began their detailed analysis in Chapter 5, I was surprised to find that the dynamics of microaggressions were relevant to all my individual findings. At that point, I found it necessary to do this literature review and establish this background.

Definition and Forms of Microaggressions

Pierce (1970) originally described subtle forms of racism as microaggressions:

> Most offensive actions are not gross and crippling. They are subtle and stunning. The enormity of the complications they cause can be appreciated only when one considers that these subtle blows are delivered incessantly. Even though any single negotiation of offense can in justice be considered of itself to be relatively innocuous, the cumulative effect to the victim and to the victimizer is of an unimaginable magnitude. (pp. 265-266)

Since then and encouraged by the work of Sue et al. (2007), there has been a proliferation of research on microaggressions that has expanded the term more broadly to include marginalized groups in general, including women (Capodilupo et al., 2010; Nadal et al., 2013). "Microaggressions are the everyday verbal, nonverbal, and environmental slights, snubs, or insults, whether intentional or unintentional that communicate hostility, derogatory, or negative messages to target persons based solely upon their marginalized group membership" (Sue, 2010a, p. 3). They are referred to as "micro," not because they are minor or harmless, but because they are everyday occurrences (Sue et al., 2019). Daily, subtle and ambiguous forms of discrimination have been found to be detrimental to people from marginalized groups' physical and emotional health (Sue, 2010a), to impact the quality of their education received, and to influence employment decisions that affect them (Sue, 2010b).

Microaggressions are categorized into three forms: *microassaults*, *microinsults*, and *microinvalidations* (Sue et al., 2007). Microassaults refer to intentional, conscious expressions of bias against a marginalized person or group. Sometimes referred to as "old fashioned racism, sexism, or heterosexism" (Sue, 2010a, p. 9), overt microassaults are increasingly uncommon given their social unacceptability. As a result, expressions of bias have become more covert

(Sue, 2010b) and fall into the categories of microinsults and microinvalidations.[12] Microinsults are generally unintentional verbal, non-verbal, or environmental signals that convey an underlying assumption of inferiority or exclusion. Examples of gendered microinsults include remarks that convey the assumption that a woman is not competent (verbal), ignoring the woman in the room because it is assumed she is the administrative assistant (non-verbal), and having few women in the workplace (environmental). Microinvalidations are also typically unintentional and deny the reality of members of non-dominant groups. One example of microinvalidation is to not "see" race or gender. When well-intentioned people do not see race or gender, they do not appreciate that the realities of people from these non-dominant groups are different from theirs. They assume that racialized people and women experience the world as they do and impose their realities. Sue (2010b) suggests that microinvalidations are possibly the most damaging of the three types because they perpetuate "the ultimate denial" (Sue, 2010a, p. 11), i.e., that dominant group members benefit from their privilege and have a responsibility to address the inequities.

Features of Microaggressions

There are several features of microaggressions that contribute to their pervasiveness. Microaggressions are outward expressions of implicit worldviews about who is superior, who is "normal," and who belongs (Sue, 2003, as cited in Sue, 2010a). They reflect implicit bias against marginalized groups and, because so many are unaware of their biases, they are usually unintentional and invisible to the perpetrator. They are also sometimes invisible to the target of

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[12] One exception to microassaults as intentional and overt are unwanted, ambiguous sexual interactions, which can trigger a fear of future sexual harassment. This microassault is intentionally ambiguous and accompanied by plausible deniability (Hart, 2021).

microaggressions because they are embedded in dominant norms. Sometimes, microaggressions are ambiguous and cause the person experiencing them to question their experience. Other times, the microaggression is clear. Regardless of microaggressions' level of ambiguity, targets of microaggressions are left with a difficult choice to make quickly in the moment and their responses typically do nothing to change the status quo. If they do not respond to a microaggression, they often feel devalued (Sue et al., 2019). If they speak up, they are often invalidated in a "clash of realities" (Sue, 2010a, p. 11). Because people want to think of themselves as bias free and "good," when perpetrators of microaggressions are confronted with the claim that their actions reflect bias, they tend to deny it and deny the reality of the person at the receiving end of the microaggression. The target of the microaggression may be accused of being oversensitive or paranoid. This denial of their reality is often more painful than the microaggression itself. Even when microaggressions are acknowledged by the perpetrator, their impact is often minimized, which is a secondary microaggression (Sue, 2010a).

Another important feature of microaggressions is that the strain that they cause is cumulative and causes harmful microaggressive stress (Sue, 2010a). Over time, the distress of each microaggression weighs heavily, leading to illness, depression, and lower performance. In addition, targets of microaggressions tend to adopt new defensive behaviours (i.e., hypervigilance, mistrust, and adoption of survival/coping strategies), internalize rage and anger, and experience fatigue and hopelessness. On the one positive note, microaggressions have also been found to help develop strength and resilience, but at a price.

Gendered Microaggressions

Researchers found numerous categories of gendered microaggressions (Capoldilupo et al., 2010; Nadal, 2010) including in STEM (Yang & Carroll, 2018)) and where gender intersects

with other forms of marginalization (Lewis & Neville, 2015; Sue & Capoldilupo, 2008). Both Capodilupo et al. (2010) and Nadal (2010) built on Sue and Capodilupo's (2008) early findings. Their findings agreed that women experience microaggressions that: (a) reduce women to sexual objects or to their appearance (sexual objectification), (b) suggest women don't deserve the same privileges as men (second-class citizen), (c) express the expectation that women are not as physically or intellectually capable as men (assumption of inferiority), (d) suggest women take on traditional roles and feminine appearance (assumption of traditional gender roles), and (e) use language that demeans women or implies they are held to a different standard (sexist language). Nadal (2010) found an additional two categories of gendered microaggressions: where perpetrators deny the underlying bias of their actions (denial of individual sexism) and where bias is conveyed through the gendered physical environment, such as an all-male class that suggests women don't belong (environmental microaggressions). Capoldilupo et al. (2010) found a notable but underdeveloped category of microaggression which expresses the message to women that they should not express their gender in a given context (leaving gender at the door).

In their development of the Gendered Racial Microaggressions Scale (GRMS), Lewis and Neville (2015) found four categories of microaggressions. They are microaggressions that (a) convey assumptions about style and beauty, including those related to cultural stereotypes (assumption of beauty and sexual objectification); (b) express that Black women are not worthy of being heard or respected in professional or educational settings (silenced and marginalized); (c) that communicate the assumption that Black women are strong or, paradoxically, should not be so assertive or independent (strong Black woman stereotype); and (d) that convey they are too angry or should calm down (angry Black woman stereotype). Yang and Carroll (2018) also found specific types of microaggressions based on their questionable modification of the GRMS

for women in STEM. Rather than repeat them here, I suggest that, with the myriad of types of gendered microaggressions (and other forms of microaggressions), it becomes clear that microaggressions are only limited by the types of stereotypes and biased assumptions that exist. In other words, gendered microaggressions are the outward expression of gender bias.

Nadal et al.'s (2013) study of gendered microaggressions found that women experience microaggressions not only from the dominant group (i.e., men) but also from their families, other women, and society. In addition, they found that women respond to gendered microaggressions in three interrelated ways: emotional, behavioural and cognitive. First, they had emotional reactions. Feelings such as guilt, humiliation, anger and fear were internalized and not expressed to the perpetrator. Sometimes, anger and fear led them to take action to protect themselves, including speaking up against their perpetrator. They found that the most common externalized emotions were fear and panic that led them to develop protective behavioural reactions. These behavioural reactions include passivity, which involves ignoring and tolerating microaggressions. They also include protecting their physical safety by evading people and avoiding conflict. Some women also confront their perpetrator assertively but often find their efforts ineffective. Women also reacted cognitively to microaggressions. For some women, their thoughts and perceptions lead them to be strong in the face of microaggressions (e.g., to work hard to prove bias assumptions wrong). For others, their cognitive reactions lead them to accept gender inequity as normal and to conform to sexist stereotypes. Overall, they found that how women cognitively respond to microaggressions influences their emotional and behavioural responses.

Microaggressions in Engineering

Very little research has been conducted on gendered microaggressions experienced in engineering. The research that has been done has primarily focused on engineering and STEM education, which is an influential time of enculturation and professionalization (Dryburgh, 1999). Researchers have found that racial and gendered microaggressions are experienced in engineering or STEM education at the high school level (Grossman & Porche, 2014; Mutegi et al., 2019), undergraduate level (Blosser, 2020; Camacho & Lord, 2011; Diaz-Espinoza, 2015; Lee et al., 2020; True-Funk et al., 2021), and graduate levels (Alexander & Hermann, 2016; Chakraverty & Rishi, 2021; Miles et al., 2020). Some focused exclusively on racial microaggressions experienced by both men and women. For example, Mutegi et al. (2019) found that racial microaggressions from other students, instructors, and the environment at a two-week, U.S. science camp for high school students were "pervasive" (p. 1456). Lee et al. (2020) found that racial microaggressions were "ingrained in the culture" (p. 1) of STEM undergraduate education at one U.S. university. In sum, students experience microaggressions at all levels of STEM and engineering education.

Some focused on the intersection of gendered and racial microaggressions among engineering undergraduate students. For example, True-Funk et al. (2021) found that engineering undergraduate students with intersectional experiences of race and gender experienced five effects of microaggressions: reduced self-belief, otherness, isolation, stereotype threat, and, perhaps surprisingly, an empowered sense of self. Upon review of this last effect, I found that the researchers describe it as knowing the microaggression was not true and using it as motivation to work harder. They presented it as a positive effect but did not seem to consider that it might also be a taxing coping mechanism (Nadal et al., 2013). Camacho and Lord (2011) found that women

engineering undergraduate students experienced microaggressions that signal they are outside the norm and have them question their sense of belonging. Examples include community members who express surprise they are studying engineering, professors who focus on them as they lecture on topics related to women, and male peers who make sexually explicit jokes. Camacho and Lord (2011) also found that women responded to microaggressions differently depending on their race/ethnicity.

All but one study that I found on the topic of microaggressions in the engineering workplace focused on the academic setting. Chen et al. (2019) found that microaggressions undermine engineering faculty's effort to include social justice issues in engineering education. Berdanier et al.'s (2017) work in progress investigates how women faculty and researchers cope with microaggressions from students in the classroom. Ramjatten (2020) investigated linguistic and gendered microaggressions that international teaching assistants experience. In the only study that I found on microaggressions in the engineering workplace, Alfrey and Twine (2017) found that some women in the tech sector avoided microaggressions by distancing themselves from traditional heterosexual femininity.

Macroaggressions

Another helpful concept related to microaggressions is *macroaggressions*. Macroaggressions are a dominant group's often tacit, shared beliefs of their superiority and entitlement that "justify" microaggressions (Huber & Solorzano, 2015). In effect, microaggressions are macroaggressions in action. Often referred to in relation to racial microaggressions (e.g., Huber & Solorzano, 2015; Sue et al., 2019), they were defined to be more generally related to all forms of microaggressions. An example of a sexist macroaggression might be the cultural association of rationality to men and as being superior to the irrationality to

women (Sweet, 2019). Sue et al. (2019) also extended the concept of macroaggressions to macroassualts, macroinsults, and macroinvalidations, which they defined briefly and loosely as referring to the institutional and systemic forms of racism (and presumably oppression in general).

Objectives of this Thesis

The objective of this thesis was to understand women engineers' lived experiences of suffering in the workplace. To do this, I defined the phenomenon of suffering in the workplace as *an intensely painful experience of loss of self and powerlessness that derives from an accumulation, over time, of demeaning incidents at work and their subsequent negation and cover-up.* The specific research question is: how does suffering in the workplace manifest for women in engineering?

Organization of this Thesis

This thesis is organized into five chapters. Chapters 2, 3, and 4 consist of individual manuscripts that have been submitted for publication (see Table 1). They include the methodology chapter, the autoethnography chapter, and the findings chapter. Chapter 5 provides a discussion of the findings and discusses the implications for research and practice. Since the manuscripts were written as standalone articles, they may not flow within the broader thesis in the same way chapters of a traditional thesis might. In addition, there will be some repetition of content where necessary to ensure the manuscripts each form their own cohesive whole. Notably, you will find two parts of the literature familiar as you read Chapter 4 (the findings chapter) because they are essential to the standalone manuscript. First, I provide a condensed version of the literature review on suffering in the workplace to distinguish what research has been done from what I intend to do. I also include it to rationalize the definition of suffering in the

workplace that I use for my primary research. Second, I draw on a subset of the literature review on women in engineering (i.e., engineering's male-dominated history) to support one of my research findings. To improve the overall flow of the thesis, I will describe the manuscripts' purposes here and include some introductory text in each applicable chapter.

Table 1

Summary of Chapters Submitted for Publication

Chapter	Title	Journal	Status
2	Phenomenology: An exciting and disruptive challenge to management researchers	*Organization Studies*	Under Review
3	How to be good: One woman's experience of suffering in the workplace	*Gender, Work & Organization*	Under Review
4	The personal is political: Women engineers' experience of suffering in the workplace	*Work and Occupations*	Under Review

Chapter 2 provides the detailed methodology used for this research, which was reflective lifeworld research (Dahlberg et al., 2008), a form of phenomenological research where researchers inquire into what is hidden or taken for granted in experience. As a standalone article it also had several other goals, including: (a) to champion the methodology for organizational research, (b) to describe phenomenological research and its philosophical underpinnings in accessible but not reductive or simplistic terms, and (c) to illustrate the main philosophical and methodological principles of the methodology through a detailed description of this research study. As part of my methods, I initially performed an autoethnographic inquiry into my own experience of the phenomenon under study. Although not included with the manuscript

submitted for review, Appendices A, B and C are provided in this thesis to give visibility into relevant details of the methods used for this research. Appendix A provides the certificates of ethical acceptability for the autoethnographic study and the primary research. Appendix B provides the interview protocols for the autoethnographic study and the primary study. Appendix C provides a graphical depiction of the entire research process, from the earliest preparations and methods described in this chapter through to the final generation of recommendations that are described outside this chapter.

Chapter 3 consists of the autoethnographic study that I performed to investigate my own experience of suffering in the workplace. This autoethnographic study investigated the historical and cultural context in which my experience took place (Denzin, 2013) and had two goals: (a) to help me reflect deeply on my experience as I prepared to conduct the phenomenological study (McIlveen, 2008), and (b) to provoke the reader to "see" my painful personal experience (and possibly theirs), not as personal weakness, but as a reflection of broader social and cultural forces. By conducting this form of inquiry, I experienced an important internal shift away from self-blame that was healing and that others may find insightful. It also prepared me for conducting the research in an unexpected way. By investigating my own experience, I discovered what was hidden or taken for granted in it and this gave me a helpful example of the kinds of insights I would be looking for using phenomenological research for the first time.

Chapter 4 presents the findings of my phenomenological study of women engineers' experience of suffering in the workplace. In this chapter, I first set the stage by providing an overview of the persistent problem of attracting and retaining women in engineering and a brief literature review on suffering in the workplace. I then identify the research question and describe the key elements of the research methodology. Consistent with interpretive reflective lifeworld

research (Dahlberg et al., 2008), the core of this chapter presents the findings in terms of seven interpretations and one overarching, main interpretation. Finally, in the discussion, I critique the dominant change strategy and recommend systemic change interventions.

Chapter 5 reflects on the findings and provides a detailed review of the findings against the existing research on women in engineering and on microaggressions. From the similarities and differences found, six provocative insights are presented that challenge the engineering profession to accept the reality of its systemic oppression of women. Areas for future research and implications for practice are identified.

At the end of the thesis, I provide a single list of references for all five chapters, including the chapters that represent standalone manuscripts.

CHAPTER 2: METHODOLOGY

Phenomenology: An Exciting and Disruptive Challenge to Management Researchers

This chapter represents a manuscript that is currently under review for publication. Its primary purpose in this thesis is to describe the phenomenological methodology that I used to conduct the research. As an article for publication, its secondary purpose is to advocate for the methodology for organizational research. To do so, I strive to overcome the challenging nature of phenomenology and phenomenological methods by using relatable language and providing detailed examples from my all stages of my research.

Abstract

Since Sanders (1982) touted phenomenology as "a new star on the research horizon" (p. 353) for organizational research, there has been only scant interest in the approach. This lack of interest is, in large part, because phenomenology represents a profound paradigm shift for researchers while its underlying philosophy is challenging to understand. The purpose of this article is to join the small chorus of those championing the methodology for organizational research by describing phenomenological research and its potential in accessible but not reductive or simplistic terms. Because there are many phenomenological approaches, this research approach does not have a prescribed method. This article aims to illustrate the main philosophical and methodological principles through a detailed description of one phenomenological study and the researcher's reflection-in-action as she made methodological decisions along the way. Potential disruptions and possibilities for organizational research are discussed.

Keywords: phenomenology, phenomenological research, qualitative research, women, engineering, suffering

Introduction

This article is an invitation for management and organizational scholars to fall in love with phenomenology and phenomenological research. Reading it represents a first date and the possibility of plunging, full body and mind, into a challenging and disruptive relationship. Falling in love is wonderful and exciting but, as noted phenomenological researcher Max van Manen warns, "real phenomenological research…. should strike fear into anyone who practices it" (van Manen, 2017a, p. 779). In this paper, I strive to illuminate phenomenology and phenomenological research in accessible, but not reductive or simplistic, terms. After all, phenomenology is "the study of experience" (Smith, 2018, p. 24) and, despite its complexity, we all have experiences. This article is also a bold call to fiercely love the people who inhabit organizations in order to create more humane organizations. Inquiring deeply into human experiences at work with openness and empathy, as phenomenological researchers do, while potentially disruptive to accepted practices, can generate insights into persistent, stubborn problems.

Despite numerous attempts to explicitly encourage phenomenological research in management, it largely remains on the fringe. Like Sanders (1982), I contend that one major impediment to its broader acceptance and practice is its inaccessibility. That is, it's hard to understand, particularly for those in management and other fields who have "grown up" with the positivist or post-positivist paradigm and take their ontological, epistemological, and methodological beliefs as truth. Not only do phenomenological research's philosophical underpinnings represent a profound paradigm shift for mainstream management scholars, but they are written in obscure and often vague language (Paley, 2016; Sanders, 1982). Even contemporary phenomenological researchers' efforts to make them accessible are initially quite

perplexing. In this paper, I first strive to describe phenomenology and phenomenological research in accessible but not simplistic terms. Then, I describe a phenomenological research study of women engineers' experience of suffering in the workplace to illustrate phenomenological research, and specifically reflective lifeworld research (Dahlberg et al., 2008), in practice. In my experience and with a leap of faith, I found that it is in the doing of phenomenological research that its challenging theoretical underpinnings become clearer. Finally, I offer Argyris' (1993) work on defensive routines in organizations as a framework for understanding aspects of phenomenological data collection and analysis.

A second impediment to its adoption may be management researchers' resistance to the new phenomenological paradigm. Specifically, they may be reluctant to adopt the paradigm because it involves setting aside possibly long-held beliefs about truth and objectivity. It also involves examining the hidden, oppressive nature of organizations that positivist and post-positivist research tends to overlook. The study described here, which aims to contribute to the persistent problem of attracting and retaining women in engineering, demonstrates this potential to generate disruptive yet productive insights into the phenomenon. In doing so, it invites management researchers to get personal and intimate with the lived experiences of humans in organizations and to courageously look for more than meets the mainstream, scholarly eye in organizations. A detailed examination of this study reveals why love (for ourselves and others), including the non-judgement and openness that accompanies love, is essential to being able to open possibilities for addressing persistent problems in organizations.

Phenomenology and Phenomenological Research

Phenomenology is a branch of philosophy that underpins a form of qualitative research called phenomenological research methods (Vagle, 2018).[13] For most mainstream management scholars, who literally grew up learning about the scientific method and believing in the importance of detachment and objectivity (Guba, 1990), they might be surprised to learn that phenomenology emerged in direct opposition to the scientific method (Russell, 2006; Vagle, 2018). To use phenomenological research methods, one must embrace a new set of beliefs or research paradigm.

What is Phenomenology?

Phenomenology is a philosophical movement that started in the early twentieth century with the radical idea from German philosopher Edmund Husserl that the mind and the world are inseparable (Smith, 2018; Vagle, 2018).[14] At the time, modern scientific knowledge was created with the Cartesian assumption that our mind and what was outside our mind were separate. Even today, this is considered quite a reasonable way to understand the world. A rock, for example,

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[13] Going against this generally accepted assertion, Paley (2016) disputes the need to underpin the research method with the philosophy, a dispute forcefully countered by van Manen (2017b) and discussed later.

[14] The work of early phenomenologists, including Edmund Husserl, is challenging even for philosophers who have studied them for years (Cerbone, 2008; Russell, 2006; Vagle, 2018). In this article and as Dalhberg and Dahlberg (2019) suggest is appropriate, I rely on philosophers and phenomenological researchers who have studied phenomenological philosophy as references.

can be understood by looking at it as separate from us. We can touch it, measure it, and break it up to examine it further. Husserl's philosophical ideas are complex, and, in this example, he would have argued that, by imagining our minds as separate from the rock, much is taken for granted in our experience of the rock (Russell, 2006). For example, when we look at a rock, we may take for granted that the rock will sink in water. Further, we need to examine the taken-for-granted-ness of our experience of the rock in a very rigorous way to generate true scientific knowledge of the rock (the "thing"). For Husserl, experience is the "grounds" of all knowledge. This is not an easy concept to absorb and its impact on our knowledge of the rock is arguably not so consequential, meaning the rock will likely sink in water so what we take for granted of it is generally correct. So, to illustrate his radical idea further, I will shift away from using rock-like things to using the "things" of *experience*, where it is more obvious why the Cartesian philosophy is inadequate and where phenomenological ideas open new and exciting possibilities for knowledge.

Things of Experience

Unlike the Cartesian belief that phenomena such as engagement, motivation, and leadership are objective, theoretical constructs to be measured, phenomenologists believe that they are things of experience or phenomena that we experience. We cannot touch them or measure them like we can a rock. They do not exist in the same way. They are "not really things at all – our actual experiences are literally 'nothing'" (van Manen, 2014, p. xviii). Things of experience, or phenomena as Husserl would say, simply manifest, appear, or come to be as we go about our ordinary lives, and bump into the world around us (Vagle, 2018). We do not plan or will for them to manifest. They just do and, as we experience them, much of our experience is tacit and outside our awareness.

Other philosophers critiqued and built on Husserl's ideas about "things." For example, Husserl's critics asserted that his focus on finding the essence of experiential "things" still maintained some Cartesian thinking (Vagle, 2018). Specifically, Heidegger shifted the focus of phenomenology to the question of being (Cerbone, 2008). [15] He rejected the idea that a "thing" can be described by its essence once and for all because phenomena manifest for us as we are absorbed in the moment and within a complex social context (Van Manen, 2017b). Heidegger believed that no matter how aware we became of our experience of a phenomena, there would always be more that we take for granted (Cerbone, 2008). Going back to our rock example may clarify any confusion here. With a Cartesian view to inquiry, a rock is a rock whether it's on a beach or in a laboratory. However, for Heidegger, phenomena (including rocks) are inseparable from their context, where a rock might be grasped as a building block in the context of a wall or a step in the context of a path. Again, this distinction is largely inconsequential for our measurement of the rock. Further, we find we've reached the limitation of the rock analogy because, unlike a rock, "lifeworld phenomena are complex, relational and embedded in the 'flesh of the world'" (Dahlberg et al., 2008, p. 233). For things of experience, this inseparability is crucial and highlights the often invisible and taken-for-granted social and cultural context of our experience. For example, a manager, having been immersed in the traditional, masculine ideology of leadership, may not notice their commitment to using heroic leadership traits (e.g., control, assertiveness) that are socially attributed to masculinity (Fletcher, 2004). For

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[15] "Two facts about Martin Heidegger (1889–1976) are as incontestable as they are complicated: first, that he remains one of the century's most influential philosophers and, second, that he was a Nazi" (Sheehan, 1988, para. 1).

phenomenologists, the manager's experience of leadership is not a *subjective* one of the prevailing ideology. In other words, the manager does not construct their experience in their mind. For phenomenologists, the manager's experience is an *intentional* one, where they are immersed "in the world vibrating of meanings" (Dahlberg et al., 2008, p. 172) and the pressure to display heroic leadership traits simply manifests without their conscious involvement.[16] "Understanding meaning is thus not a cognitive act - we do not deduce it out of given clues, but it rather takes hold of us - like when we smell freshly brewed coffee" (Dahlberg & Dahlberg, 2019, p. 3).

The Natural Attitude and the Lifeworld

Two more concepts are fundamental for phenomenological researchers to understand but have only been alluded to so far: the *natural attitude* and the *lifeworld.* When we are going about our everyday lives, we normally do this with the natural attitude, where our frames (or what we look through) are invisible to us and distort the truth (Russell, 2006). More broadly, Dahlberg et al. (2008) describe the natural attitude as "the everyday immersion in one's existence and experience in which we take for granted that the world is as we perceive it, and that others experience the world as we do" (p. 33). With the natural attitude, we experience the *lifeworld*, "where our living and experiencing of phenomena take place" (Vagle, 2018, p. 7). The lifeworld is the world we experience where our relationship with the world is unexamined and tacit (Dahlberg et al., 2008). It is a rich and complex world that is ultimately inescapable. It is where

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[16] Phenomenologists' meaning of the word "intentional" is different and should not be confused with the more commonly understood meaning (i.e., "done by intention or design" (Merriam-Webster, n.d.)).

we are all interconnected and yet experience our own unique lifeworld. For phenomenologists, all inquiry begins in the lifeworld and different conceptualizations of the lifeworld open different possibilities for understanding experience. Husserl felt that the natural attitude was unscientific and insufficient for creating knowledge since scientists were uncritical of what they took for granted in their own relationship to the world (Dahlberg et al., 2008; Vagle, 2018). In place of the natural attitude, he suggested scientists take on the *phenomenological attitude* to access knowledge and "question what we typically take for granted" (Vagle, 2018, p. 13).

A Brief Introduction to Phenomenological Research

Husserl did not intend for phenomenology to be a research method, but contemporary researchers have taken his ideas (and the ideas of others coming out of the phenomenological philosophical movement, such as Martin Heidegger, Maurice Merleau Ponty, and Hans-Georg Gadamer) and developed a wide variety of phenomenological research methodologies (Vagle, 2018).[17] Generally speaking, phenomenological research is a form of qualitative research where researchers inquire deeply into the first-person, lived experience of phenomena to discover what is hidden or taken for granted in experience (Vagle, 2018). "*Phenomenology is not concerned with generalizing, quantifying, and findin*g" (p. 11). Rather, it is concerned with gaining a deeper understanding of our experiences to generate understanding and insight.

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[17] Vagle (2018) delineates major phenomenological research methodologies (while acknowledging the artificiality of such delineations) as descriptive, interpretive, reflective lifeworld, and post-intentional and attributes them to the work of Amedeo Giorgi, Max van Manen, Karin Dahlberg, and Mark Vagle, respectively.

My excitement for phenomenological research in management reflects my belief that patterns of behaviour take shape in our everyday, ordinary experience of our work lives while we are often on a form of automatic pilot. While on this automatic pilot, we generally do not notice the organizational culture, our tacit assumptions that we have developed over time about how the work world operates, nor the sensations we experience in the moment. Further, and consistent with critical management researchers, while on automatic pilot, we fail to notice the invisible, yet oppressive nature of organizations, which is often obscured by mainstream management studies' "ideological acceptance of inequality" (Magee & Galinsky, 2008, p. 377). Phenomenological research, particularly with a critical management lens, offers the possibility of "destabilizing that which is taken for granted in dominant accounts of management knowledge" (Jeanes & Hubbard, 2014, p. 4) and generating insights into persistent problems.

Fundamental Methodological Principles of Phenomenological Research

Although there are many phenomenological research methodologies, they share three fundamental methodological principles. First, Vagle (2018) emphasizes that all strong phenomenological research relies on coherence between one's philosophical beliefs, one's methodological approach and methods. Practically speaking, this means to grasp the underlying philosophy and be faithful to it throughout the research project. Second, it is agreed that the object of study is the phenomenon in its everyday, ordinary, lived experienced.[18] As such, phenomenological researchers inquire deeply into the private, inner, lived experience of people

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[18] There are many forms of qualitative inquiry that study lived experience, such as narrative inquiry, ethnography, and general qualitative research, but not all studies of lived experience are phenomenological (van Manen, 2017a).

in organizations as it is lived "pre-reflexively" (van Manen, 2017a, p. 2) in the lifeworld and with the natural attitude. Here, "pre-reflexively" refers to the experience as we live it, without reflection or intellectualization about it, as if on automatic pilot, with much taken for granted, "in the same way as the air we breathe, or as water is to the fish" (Dahlberg & Dahlberg, 2003, p. 36). Rather than inquiring into issues, perceptions or opinions, phenomenological research aims to uncover what is hidden or taken for granted in our everyday experience. Finally, phenomenological researchers also agree that we researchers also experience our own unique lifeworld and must deliberately approach our research with some form of a reflective, phenomenological attitude, described by Finlay (2008) as the "one of the more (if not *the most*) significant dimensions of phenomenological research" (p. 2). One form, Dahlberg's (2006) concept of a *bridled* attitude, involves conducting every step of the research process with an ongoing, open, reflective stance.

Is all this Philosophy Really Necessary?

John Paley, in his scathing critique of phenomenological research methods, makes the contrarian's claim that it is not necessary to underpin it with phenomenological philosophy (Paley, 2016). He supports his assertion by adding, quite fairly in my opinion, that it is impractical for researchers to substantively understand the "almost willfully obscure" (p. 7) works of Husserl nor the "densely difficult and irritatingly opaque" (p. 7) works of Heidegger. In addition, he thought provokingly calls out notable methodologists for not clearly defining what is meant by "meaning," or what phenomenologists are looking for. However, Paley gets tripped up in his own argument. By denying the relevance of the original philosophy, he fails to understand Husserl's radical idea at phenomenological research's core and the ground-breaking difference between subjectivity and intentionality, as van Manen (2017a) says many "phenomenologists"

do. His big tell is his focus of criticism on meaning attribution, which, according to van Manen (2017b), "has nothing to do with phenomenological method" (p. 1). As the philosophical underpinnings suggests, the complexity of attending to the lifeworlds of both the participants and the researcher is where phenomenological research methods prove so exciting and perplexing. It is also where the basic philosophical concepts of the *natural attitude*, the *lifeworld*, and *intentionality*, become so relevant and practical, as will be described later.

Vagle (2018) suggests that what is necessary, as a steppingstone into this challenging method, is an understanding of some of the key philosophical concepts – the ones that are really mind bending or paradigm shifting – and then an effort to explore the philosophy further to increase the "amplitude" (p. xiiv) or the quality of one's findings. One can do this by studying the philosophers or those researchers who have studied the philosophers (Dahlberg & Dahlberg, 2019). I extend Dahlberg and Dahlberg's (2004) invitation for nursing researchers to management researchers, "instead of being troubled by how it is possible to understand and describe another's lifeworld we should be happy about the opportunity to encounter other lifeworlds…[and] to know, make explicit, and describe the meaning of lifeworld phenomena" (p. 273).

Use of Phenomenological Research Methods in Management

Although it's not unusual to see phenomenological research methods used in other disciplines, management scholars have only shown modest interest since Sanders' (1982) touted phenomenology as a "new star on the research horizon" (p. 353) in management studies forty

years ago.[19] In their wide-ranging discussions of qualitative research in organizations, some cover it only briefly (e.g., Klenke, 2016; Cassell & Symon, 2004) while others do not mention it at all (e.g., Ciesielska & Jemielniak, 2018; Elsbach & Kramer, 2015; Eriksson & Kovalainen, 2016).

Others have joined Sanders (1982) in advocating for phenomenological research methods in management. For example, Küpers (2014) draws on French phenomenologist Merleau-Ponty's work and encourages inquiry into the often-neglected, real flesh and blood nature of the people in organizations. Erhard et al. (2013) and Souba (2014) encourage the first-person phenomenological study of leadership *as it is lived*, rather than as it is described by a third party. Similarly, Voronov and Weber (2020) encourage institutional scholars to reflect on how their conceptualization of people as *actors* neglects the human experience and limits their inquiries. Gill (2015) advocates for the phenomenological study of emotions in organizations. Gibson and Hanes (2003) argue for its use in the field of human resources. Raelin (2020) advocates for the inquiry of leadership-as-practice, with Bombala (2012) focusing his advocacy of phenomenology on management's ethical practice. In addition, research has been conducted using phenomenological methods in a broad range of management areas of study, including the embodied nature of leadership (Ladkin, 2013; Küpers, 2013), strategy (Küpers et al., 2013), workplace bullying (D'Cruz & Noronha, 2011), group life (Sondak, 2002), and entrepreneurship (Berglund, 2015). However, despite the exemplar efforts described here, phenomenology

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[19] Phenomenological research methods have been used in education (e.g., van Manen, 2016; Vagle, 2018), nursing (e.g., Dahlberg et al., 2008) and psychology (e.g., Giorgi, 2009; Polkinghorne, 1989; Smith, 2017).

methodologies have failed to infiltrate mainstream management science in a substantial way, as evident in its virtual absence at the largest management academic association's 2021 conference, where only one of 1650 sessions focused on phenomenological research (Academy of Management, n.d.).

With so much hidden in organizations (Argyris, 1993; Frost, 2003; Marshak, 2006; Schein, 2017), there remains tremendous potential for phenomenological research (Gill, 2014). In one example of phenomenological research in management, D'Cruz and Noronha (2011) found disruptive, hidden meaning in their phenomenological study of bystanders' experience of addressing workplace bullying. Probing their experience revealed that the bystanders "naturally and automatically" (p. 281) withdrew their overt support for the target of the bullying as they engaged in the process of helping them navigate the company's complaint process. Further, the bystanders did not notice their seeming lack of choice in their withdrawal of overt support. Their findings revealed that human resources (HR) policies and practices privilege management, constrain the bystanders' choices, and dampen bystanders' resolve to help, contrary to HR's stated goals. Ultimately, as in this study, phenomenological research in management has the potential to generate insight into persistent problems and challenge existing practices.

Study of Women Engineers' Experience of Suffering in the Workplace

To illustrate phenomenological research in practice, one study is described here in detail. The primary purpose of this Canadian study was to explore women engineers' experience of suffering in the workplace. This phenomenon is widespread and largely hidden in organizations (Frost, 2003) and is particularly relevant for women engineers where they are a small minority in

the profession[20], despite forty years of research (Ayre et al., 2013). I drew primarily on a reflective lifeworld research approach (Dahlberg et al., 2008) which, like most phenomenological research, resists a prescribed method (Vagle, 2018). As advocated for qualitative thematic analysis by Braun and Clarke (2006), decisions about method should be explicit and grounded in philosophical beliefs. In this section, I will describe the method I used and illustrate the methodological principles in action by spotlighting key methods, selected data, a sample analysis, and a partial finding. As I will show, I learned about phenomenological research in the doing of phenomenological research.

Identifying the Phenomenon

When choosing a phenomenon to study, Vagle (2018) recommends choosing something the researcher is passionate about. This passion, he suggests, will fuel the researcher's sustained engagement with the lived experience of the phenomenon throughout the research project. My experience of suffering in the workplace as a woman in engineering blindsided me and had a profound impact. While extremely painful, it created in me a deep curiosity for organizational life and empathy and love for those who inhabit organizations. I also had a sense that I knew this phenomenon "in my bones." With Vagle (2018) also advising that taking on the

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[20] Women constituted 24.2% of engineering graduates in Canada in 2020 (Engineers Canada, 2020b) and 14.2% of practicing engineers in 2020 (Engineers Canada, 2021). Once practicing in the field, women engineers experience more burnout than their male counterparts (Hall et al., 2015; Ronen & Pines, 2008) and leave for other fields at a higher rate (Hunt, 2016) in what is often referred to as a "leaky pipeline" (Faulkner, 2009a, p. 15).

phenomenological attitude begins as one chooses the phenomenon of study, I had to approach my study with humility and bridle my pre-understandings right from the start.

Defining the Phenomenon and The Research Question

My goal was to develop a definition that would be clear for potential participants as I solicited their participation but that left room for those participants to teach me something new about the phenomenon. To do this, and as Vagle (2018) recommends, I "spen[t] time with the phenomenon" (p. 77). In my effort to both clarify the phenomenon and remain open to the phenomenon, I spoke informally to friends (not necessarily engineers or women) about their experience of suffering in the workplace, I read about suffering in general and in the workplace, and I journaled about my own experience. I drafted a definition, shared it with those I had spoken to about their experience of the phenomenon, and gathered their feedback. I then tentatively defined the phenomenon of study as *an intensely painful experience of loss of self and powerlessness that derives from an accumulation, over time, of demeaning incidents at work and their subsequent negation and cover-up.* Concurrently, I developed the specific research question: how does suffering in the workplace manifest for women in engineering?

In addition to informally exploring the phenomenon, I conducted an autoethnographic inquiry of my experience, an inquiry that McIlveen (2008) recommends for researchers who want to increase their self-awareness in service of their research. An autoethnographic study is one where the author inquires into personal experience to illuminate historical and systemic features of the experience (Denzin, 2013; Ellis et al., 2011). My autoethnographic study revealed hidden aspects of my experience and helped me understand more practically what is meant by the lifeworld. For example, I noticed a pattern where I responded to demeaning incidents with a bodily sensation of numbness accompanied by silence, self-blame, and shame. Further, without

realizing it, I responded in a learned, automatic way and never realized I had other choices in responding. From a phenomenological point of view, this choice was hidden to me. After my autoethnographic study, I understood my experience through Merleau-Ponty's idea of lifeworld as *flesh* (Dahlberg et al., 2008), where we are part of one, interconnected whole and where phenomena stand out against a background or a "mute and invisible fabric of meaning" (Dahlberg et al., 2008, p. 217). In one particularly memorable moment, a man who was close to me was subtly but egregiously hostile towards me after I had corrected him on the physics of a golf swing. I instinctively moved to silence, blaming myself for having "crossed a line." Something hidden in the flesh of the lifeworld moved me to silence and moved him to act brazenly, as if with impunity. The autoethnographic study not only revealed hidden aspects of my experience but, for this novice phenomenological researcher, provided an experience of witnessing my unique lifeworld, "where our living and experiencing of phenomena take place" (Vagle, 2018, p. 7).

Choosing a Sample and Recruitment

Phenomenological research typically involves choosing a sample (Vagle, 2006) of participants who have experienced a wide variation of the phenomenon under study (Vagle, 2018). As a group, I looked for participants who reflected a diversity of years of experience, engineering disciplines, industries, geographic locations, and intersectional (race, sexuality, ability, age, etc.) experiences (Hill Collins & Bilge, 2020). I invited participants to self-identify as having experienced suffering in the workplace, using the tentative definition developed for this study as a guidepost. Self-identification, without a rigid definition, was important because "suffering is ultimately a personal matter – something whose presence and extent can only be known to the sufferer" (Cassell, 1991, p. 35). Further, it was important that they self-identify as

reflective and willing to share and explore their experience of the phenomenon in depth with the researcher (Polkinghorne, 1989; Vagle, 2006) while capable of doing so in English. Finally, it was required that participants were no longer in the work context in which they experienced suffering. The reason for this criterion was two-fold: to reduce the risk of their participation causing emotional distress and, once out of the context, their suffering may be more apparent to them (Charmaz, 1999).

Because accessing what participants take for granted in their experiences of phenomena involves their voluntary, vulnerable exposure, building a trusting relationship with the participants is essential (Dahlberg & Dahlberg, 2004). Possibly even more so for the experience of a vulnerable topic such as suffering, great care was necessary to recruit participants. After all, to admit to having suffered in the workplace is to risk being seen as soft or weak (Frost, 2003). In all my communications and beginning with the recruitment process, I endeavored to *show* my trustworthiness rather that *tell* them about my trustworthiness. I created a short video on social media in which I explained the research and shared my personal connection to it. Interested participants were asked to complete a short survey and 12 people completed the survey. I then invited each potential participant who met the sampling criteria to a one-on-one session with me to explain the research, review the consent form, and get to know me. During this meeting, I respectfully asked questions to ensure they had the willingness to reflect deeply on their experience as part of the research. I selected the first six participants who, together, represented the variation criteria defined in the ethics protocol.

Data Collection

With no prescribed method, phenomenological researchers are encouraged to design their data collection based on their unique phenomenon under study. For me, this involved the

challenge of gathering phenomenological material on a phenomenon that involves specific painful moments but is more like "death by a thousand cuts." Kanov's (2021) distinction between "*severe or protracted distress*" (p. 86) in his working definition of suffering in the workplace was helpful in developing my strategy. To access the experience of severe distress, I asked each person to reflect on a critical situation and write a critical situation narrative (van Manen, 2016). After reviewing the narrative, I planned to explore this and other severe experiences further in the interviews as well as probe their experience of protracted distress.

Pilot Data Collection and Lessons Learned

Before the research began, pilot data collection was conducted with two women, one who experienced suffering in a different male-dominate profession and one who experienced suffering in an engineering workplace but who otherwise did not fulfill all the study's inclusion criteria. The goals of the pilot data collection were to evaluate the critical situation narrative instructions and experience the phenomenological interview in practice. The critical situation narrative instructions proved effective, and no changes were made. However, four significant outcomes emerged from the pilot interviews.

First, I gained confidence that I had experienced a paradigm shift, where after months of study I could clearly distinguish between a description, opinion, or theory of what happened and a description of the experience of what happened. In other words, I could "just see phenomenology in [my] head" (Vagle, 2018, p. 180). Second, I received feedback that, by jumping right into my questions, my participant felt I didn't care about her, as a person and for her experience of writing the narrative. As a result, I expanded my interview opening remarks with a focus on building the relationship, affirming the critical situation narrative, and bridging it to the interview. Third, in one particularly vivid interview moment, I intentionally departed from

my phenomenological stance to test out what would happen. In my mind, I "knew" that the participant was denying an aspect of her experience and I wanted to confirm my own idea. When I asked her my confrontative question, her tone and body language seemed to stiffen as she denied it and provided an explanation. I sensed a shift in the relationship where trust was broken. As Vagle (2018) had warned against, I had "grind[ed] the interview into a halt" (p. 91). It confirmed to me that when such strong feelings came up in me in the future, I would need to stay open and curious (Dahlberg et al., 2008). During the interviews, I would need to recognize when I became attached to a particular outcome and shift back to asking open questions from a place of humility. Finally, this experience of conducting the pilot interviews clarified the "in action" nature of phenomena and a practical lens for conducting data collection and analysis, as I explain further.

According to Vagle (2018), phenomenon just happen or manifest as we are in action, reminding me of Argyris' body of work on defensive routines. Argyris (1993) found that people have two theories of action: espoused theory (that drives *what we say*) and theory-in-use (that drives *what we do* – in action). In organizations, when we are faced with threatening or embarrassing situations, our espoused theory is usually incongruent with our theory-in-use and this incongruence is skilfully outside our awareness and undiscussable. Simply stated, when we are faced with embarrassment or threat, what we do is often not what we say we would do, and we don't notice the difference (and we certainly don't talk about it openly). Since phenomena manifest while we are going about our everyday lives in action, they have nothing to do with our espoused theories and everything to do with our theories-in-use. During data collection, asking questions that solicit participants' theory-in-use, rather than their espoused theory, invites rich experiential data. In addition, and during analysis, keeping an eye out for and delving into any

explicit incongruence between participants' espoused theories and theories-in-use can be an important source of phenomenological insight.

Critical Situation Narrative

Writing a critical situation narrative invites the research participant into a reflective stance and serves to prime them for the interview (Dahlberg et al., 2008). For this study, it also served two additional purposes with this vulnerable topic: (1) to have them feel at ease coming into the interview, knowing that the researcher knew their story as they wanted to tell it; and (2) to serve as a starting point and a map to guide the interview. Participants were told, "Select a meaningful and vivid memory of an incident in the workplace that contributed to your suffering." They were provided the following instructions, inspired from examples provided by Dahlberg et al. (2008) and van Manen (2016), with no page limit:

1. Please write a direct account of this personal experience as you lived through it (in the first person). Write as concretely, precisely and with as much detail as possible. As much as possible, avoid vague generalizations, temptations to theorize, political correctness, etc.
2. Describe the experience from the inside, as it were; almost like a state of mind: the feelings, moods, emotions, etc.
3. As you focus on your particular incident, describe specific events, a happening, a particular experience.
4. Attend to how the body felt, how things smelled, how they sounded, etc.
5. Avoid trying to beautify your account with fancy phrases or flowery terminology.

Many participants expressed concern over email that they had not provided what was needed. I consistently responded by affirming their work and sharing my heartfelt reaction,

writing for example, “Thank you for sharing this painful story with me. I'm so sorry that you went through this.” Early in the interview, I thanked them again for their narrative and asked about their experience of writing it. I suspect that any phenomenological interview has the capacity to be both distressing and exciting for participants as they learn what they take for granted in their experiences. In this study, many participants said it was emotionally difficult (with one even describing it as “traumatizing”) but all agreed it was worthwhile.

Preparation for Interview

The critical situation narrative proved a helpful tool to prepare for the interview. First, some narratives were starkly different from what I expected and provoked anxiety in me as I initially thought they were inappropriate for the study. This anxiety and its contrast with the excitement I felt when reading other narratives jolted me into bridling my experience, to remaining open to finding something new. My anxiety reminded me that the phenomenon is the leader and the researcher its humble follower. I set aside my newly revealed, pre-conceived idea and shifted to openness about what a “good” critical situation narrative was. As Vagle (2018) says, “when we find ourselves having negative or positive emotional responses to something a participant shares, these are often the best moments to bridle” (p. 91).

Second, unlike an interview where the researcher must respond in the moment, I was able to study the narrative at my own pace. I read it and re-read it, adding my own reactions to the narrative, without self-censorship, as a form of bridling where I named the reaction only to pause and remind myself to shift to openness. Without pressure of time as would be necessary in the upcoming interviews, I sharpened my skill of distinguishing between context, explanations, generalizations, and descriptions of experience. For each narrative, I drew a timeline of significant moments and noted key words (including metaphors) for the interview. Finally, I

created a unique, tentative plan for each interview using the narrative as a starting off point to explore both the severe and protracted distress experienced by the participants. Overall, the critical situation narrative helped me go into the interview prepared to balance planning and emergence that Dahlberg et al. (2008) describe as essential to bridling.

Framing the Interview

I began the interview by covering the following topics, all with a focus on building the relationship and setting the container (Bushe, 2010) for deep reflection and sharing: (1) welcome and thank you, (2) review of key consent items, (3) inquiry into how they experienced writing the critical situation narrative, and (4) description of the interview approach – ensuring that they knew what to expect over the course of the interview. The last topic was particularly important because I found that some participants had difficulty getting in touch with their experience. For example, instead of responding with their thoughts, feelings, and sensations, some responded primarily with explanations, generalizations and lessons learned. While this data is useful to understand their beliefs and the context of the experience, I needed to find a way to also obtain experiential data.

> I used the metaphor of a movie and described my interview approach to them as follows: Unlike what you might expect, I don't have a pre-set list of questions, I have more of a roadmap of where I want to go that I developed using your critical situation narrative. I'm using a phenomenological approach which means the study of your experience. And so, I'm less interested in what happened to you as much as I'm interested in how you experienced what happened. If we compare the interview to a movie, you might set a scene and tell me what happened, which is obviously very relevant to your experience,

but I'll be interested in probing your internal, private experience of what happened that the camera couldn't capture.

Conducting the Interview

Phenomenological research requires the interviewer to reflect in action (Schön, 1983). In reflective lifeworld research, the goal is to probe deeply and be open to the unexpected (Dahlberg et al., 2008). To achieve this goal during the interviews, I focused on experiences of the phenomenon and strived to obtain descriptions of lived experience, guided by openness, curiosity, presence, and authenticity. With just my tentative interview plan and without any further prepared questions, I let the phenomenon reveal itself by following the research participants' lead (e.g., asking spontaneous questions to clarify and deepen their description of experience), a strategy that Vagle (2018) offers is analogous to improvisation, with the first rule being "*Agree. Always agree and* Say Yes" (p. 91). I endeavored to stay laser focused on the experience, clearly distinguishing in my mind between description of the lived experience (inner, private experience that the camera cannot capture), pre-understandings, description of the context that shaped their experience, opinions, generalizations, and attributions of others. This often meant that, as they described what happened, I would probe for what thoughts, feelings, and sensations were going on inside of them during their experience, generally asking "in simple terms… 'what is this or that kind of experience like?'" (van Manen, 2017b, p. 2). In the following sub-sections, I will provide an example to illustrate philosophical and methodological beliefs in practice.

Nicki. In her critical situation narrative, Nicki described herself as a male-presenting, lesbian engineering undergraduate student and recalled the steps she took to protect herself while doing a paid work term in a large, multi-national, manufacturing environment. A male colleague

initially presented himself to her as friendly and helpful. She was grateful because he was one of the few to do so in her overwhelmingly male-dominated, homophobic work environment and having such a supporter helped her tremendously in her work. One day, he asked her if she had anyone special in her life and she cautiously confided in him that she was a lesbian. For the next few weeks, his friendly visits and chats became more frequent. One day, with his casual greeting, she had a swift, embodied reaction. She sensed danger and "knew" he would say something inappropriate. From that moment, he began making increasingly disturbing sexual advances in person and, despite her discouragement, continued harassing her with sexually explicit content over social media and text message. She wrote that she blocked him from social media, but not from text messaging, in case he needed to contact her for work related matters.

Bridling my Reactions. Nicki's critical situation narrative shocked me. I initially had not expected that women in engineering still experienced such flagrant and abusive behaviour today. My own experience, even thirty years ago, reflected a more subtle, paternalistic context. I wondered anxiously and perhaps naively, if this was the kind of suffering that I was looking for. Again, it was a reminder to stay open. During the interview, I strived not to convey any hint of shock out of concern that she might feel shame. I tried to dismiss any pre-conceived ideas of what I might discover in the interview.

I was also flabbergasted at her seemingly timid response to his egregious acts.[21] Why not block him entirely? There must be other ways to contact him for work related issues, I thought. I thought of her as naively dutiful and attributed these traits to her youth. With the luxury of time

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[21] The word "timid" came to me as an initial interpretation that evolved throughout the analysis as I bridled it.

before the interview, I was able to recognize the need to bridle and shift to openness. Bridling, in this case, did not mean to ignore my reaction but to be curious about what triggered it.

Interview Sequence and Timing. As I interviewed Nicki, inquiry into her blocking him from text messages was one part of an overall plan that I had developed using the critical situation narrative. I looked for an opportunity that felt natural, preserved her flow, and did not disturb an ongoing avenue of inquiry. As Vagle (2018) emphasizes, the interviewer needs to know when to lead and when to follow.

Attentive to Lived Experience Descriptions. At an appropriate moment during the interview and as I bridled my judgment, I asked her to say more about blocking him from social media and not from text message. By asking her to say more and avoiding questions that call her to explain herself, I was inquiring into her theory-in-use and not her espoused theory. I noticed that I felt uncomfortable asking this and other questions that risked embarrassing her. However, since to hide is a common reaction to embarrassment and shame (Lewis, 1971), I came to consider this feeling as a sign that something hidden might be revealed and asked the question as sensitively as I could, sometimes sharing my own similar experiences to make it acceptable to put such covert experiences on the table (Marshak, 2006).

In her response, she said, “it was gonna put a huge wedge into my work for me to delete him off text.” With the focus on finding descriptions of lived experience, and given the interviews were conducted over video conference and recorded, I made only brief notes for follow up questions. As Nicki spoke, I noted the word “wedge.” Despite the fact that her reasoning was the same in this response as in her critical situation narrative, the metaphor represented an opening for further phenomenological material.

Co-Discovery of Meaning. I asked her to say more about the “wedge.” Her response

seemed to reflect something she knew deep down but hadn't quite realized. She was now collaborating with me in the research process (van Manen, 2016). In this container, it was as if she was discovering it at the same time as me. She revealed her internal dilemma:

> My manager wasn't very accepting. My manager was pretty close-minded about a lot of that stuff, and I don't see him taking this information positively or, I don't think he would understand. I think if I blocked him, my manager would be like, why did you block so and so? He can't get ahold of you. He told me he's been trying to call you and text you for the past two days. What's going on? Those were the conversations I was avoiding and did not want to have. Like, I put my own suffering, I kind of let myself suffer, in that way, to avoid other suffering.

This discovery represents a "good reason for everything" (Lesche, 1971, as cited in Dahlberg et al., 2008, p. 283). They encourage researchers to look for good reasons for seemingly irrational behaviour as they interpret their data. What appeared initially to me as her timid response of not blocking him on text messaging began to look like her way of coping, of surviving.

Data Analysis

In reflective lifeworld research, there are two options for data analysis: (1) descriptive analysis, where interpretations are derived only from the original data provided by participants; and (2) interpretive analysis, where interpretations are grounded in the participant data but also include data from outside the study, including theory and researcher experience. This study used an interpretive analysis primarily because it was expected that the phenomenon would be a complex one with hidden "social structures or power relations that otherwise are hard to identify" (Dahlberg & Dahlberg, 2019, p. 4). The goal of a reflective lifeworld interpretative

analysis is to develop a comprehensive and cohesive set of implicit and explicit meanings along with their intentional explanations that is possibly generalizable (Dahlberg et al., 2008, p. 280). To accomplish this goal, a whole-parts-whole analysis was used (Dahlberg et al., 2008). The first whole reflects the raw data collected. This first whole is divided into meaning units or parts as it is analyzed and interpreted. The final whole represents a new whole and is made up of implicit and explicit meanings that were found in the data. This new whole is articulated in a phenomenological text that immerses readers in the experience of the phenomenon.

Individual Participants

I conducted a process of analysis that overlapped with data collection. For each interview, I reviewed the automated transcript by comparing it to the audio recordings. I then sent it to the participant for validation and invited them to add and delete text. Few made any changes.

I then proceeded with my first reading of the "whole," as Dahlberg et al. (2008) suggest. As I read, I simultaneously watched the video recording, which helped me relive the experience of the interview. As a researcher new to phenomenology, I found myself anxious to do the analysis "correctly." I could read it through repeatedly to get a sense of the whole but then I found myself apprehensive about the prospect of identifying the meaningful "parts" or meaning units. I chose to read it through again, but this time, I recorded my spontaneous reactions, including thoughts, emotions, and links to my own experience. As I proceeded with other participants' transcripts, I also recorded links between participants. My philosophical understanding of phenomenology gave me the confidence that I could record, without self-censorship, whatever thoughts came to mind. These were not final judgments and conclusions – far from it – they are there to make them explicit so that I could bridle them or hold them loosely

as the analysis progressed.

Once I had recorded my reactions, I went through the transcript looking for "parts" or relevant meaning units (Dahlberg et al., 2008). For each participant, I created a table and began to cluster meaning units of the transcript into possible patterns of meaning. Here too, the concept of bridling encouraged me to hold the possible patterns of meaning loosely. In addition, in phenomenological research, with a tension between creativity/imagination and rigour/science (Dahlberg et al., 2008, Vagle, 2018, van Manen, 2016), I recognized that my anxiety around doing it right was interfering with my creativity. Now, as I clustered meaning units (parts), I didn't fret over the label and, as I found related meaning units, I added to the labels. For example, as I reviewed Nicki's transcript, the label evolved as I organized the meaning units, "Coping, choosing the path of least resistance, avoiding what she didn't think she could handle, escape route, strategizing." I didn't feel pressure to label the potential patterns of meaning "correctly" at this stage. Further, while interpretation is happening all the time, I hesitated to make explicit interpretations of the data just yet, "to not make definite what is indefinite" (Dahlberg & Dahlberg, 2003, p. 34) as long as possible.

I also developed follow-up questions for a second interview with the same luxury of time afforded me by the critical situation narrative. I then repeated the same process of reviewing the transcript, having the participant validate it, reading the "whole" while recording my reactions, and continuing to add to the potential patterns of meaning.

Putting the Participants' Data Together

As I moved on from analysis of one participant's data to another, I began to "see" patterns of meaning that had previously been hidden to me. I began to make tentative interpretations as the new whole emerged, including using theory and my own experience as

sources of insight. Using the principle of the hermeneutic circle, I moved "from the whole to the parts and back to the whole again" (Dahlberg et al., 2008, p. 281), as described below.

Having completed an initial analysis of Nicki's experience, I still retained the interpretation that her timid response to her aggressor was reasonable, even "natural," to me for someone her age. As I analyzed others' experiences, having analyzed Nicki's data, I began to evolve my interpretation. Another participant, Diane, had over 20 years of experience when she experienced suffering in her workplace. With her impressive listing of accomplishments, her emphasis on her resilience, and her confident statements, I developed a sense during the interview that she was a hardened fighter and did not initially notice any timidity, in contrast to Nicki. During the analysis of the data from her critical situation narrative and interviews, it suddenly dawned on me, in a "lightning act" (Ödman, 1979, as cited in Dahlberg et al., 2008, p. 277) of understanding that her responses also appeared timid on the surface. With this contrast, I began to "see" her experience differently, not as timid, but as doing what she needed to do to survive in an environment that she learned to handle over the years. In hindsight, the meaning in Diane's experience was invisible to me because her cautious responses seemed so natural to me, having experienced the phenomenon myself. In phenomenological terms, I initially failed to bridle my pre-understanding. Review of the other participants' data revealed a similar pattern of meaning, where participants were cautious in their responses to injustices. In addition, feminist theory was used to supplement their experiential data. Ahmed (2017) describes women's accumulated learning through their experiences of injustices and of being in spaces where they are not expected to be:

> You are taught to be careful…And you sense the consequence: if something happens, you have failed to prevent it. You feel bad in anticipation of your own failure. You are

> learning, too, to accept that potential for violence as imminent, and to manage yourself as a way of managing the consequences. (p. 24)

Her theory sparked further interpretation.

Finding Meaning: The Danger of Being too Bold

Here, I continue to share my reflective practice by spotlighting the process of evolving this meaning and discovering a deeper one: the danger of being too bold. The participants' cautious responses to injustices did not tell the whole story and stood out starkly against their overall boldness. Given the dearth of women engineers in Canada, their mere presence and persistence in their profession is bold, as Diane and others described. They must work harder than their male counterparts to fit in to the male-dominated culture (Dryburgh, 1999) and, in Quebec (where data is available), they experience three times more discrimination than women in the general public (Ordres des ingénieurs du Québec, 2022). Ahmed's (2017) work provided a clue to resolve this contradiction: as women, they had learned to be careful. Review of their experiences with this clue in mind revealed there were moments when they "knew" they had crossed a line. Just as Nicki "knew" with her embodied reaction to an ostensibly innocent greeting, that her "friendly" colleague was a threat, other participants experienced a threat in a moment of embodied "knowing." Each knew they were going to pay a price for what they initially judged as safe. What initially appeared to me as timidity in one participant, and later as cautiousness, became interpreted as an act of being careful in an environment that they knew was dangerous. As women engineers, hidden in their experience of suffering was the danger of not properly balancing being bold as they challenged gender norms and being careful as they navigated those same gender norms. Ahmed's (2017) feminist theory explains:

> Becoming willing to participate in sexist culture is a compromise, even if it is not

> registered as such, because we have been taught (from past experience, from what we come up against) that being unwilling to participate can be dangerous. (p. 36)

Complete, Disruptive Findings

The above finding (interpretation of meaning) represents only a glimpse into the participants' experiences to illustrate phenomenological research in practice. The complete findings, while not presented here, include seven such interpretations and a main interpretation that tie them together. Suffice it to say that these women, who had each overcome stereotypes of women and engineers, suffered, hidden in plain sight, while they persisted in threatening work environments.

This study provides examples of the disruptive potential of phenomenological research. First, it disrupts the common assumption that those who suffer in organizations are weak (Frost, 2003) when it found that women in engineering who suffer are skillfully doing what they learned to survive in impossible situations. It also raises questions about the tacit acceptance of the throw away employee (i.e., the burned-out employee or the employee that "can't handle it"). In addition, it sheds light on why, despite forty years of interventions to attract and retain women in engineering, progress remains slow. Many of the interventions, such as scholarships, success profiles, and awards, don't begin to address the impossible dilemmas faced by some women engineers. Finally, the physical, emotional, and material harm experienced by women in engineering challenges the framing of the problem as a "leaky pipeline" (Faulkner, 2009a, p. 15) of women in engineering, with images of a harmless, gentle trickle.

Implications for Management Research

To adopt phenomenological methods, management researchers are invited to look at organizational life differently. Analogous to van Manen's (2016) critique of mainstream

education research, in mainstream management researchers' "abstract theorizing" (p. 139), they have largely ignored or lost touch with the lifeworld of employees. Just as he calls for educational researchers and students, management researchers are invited to love, respect, and admire the people who inhabit organizations and help create more humane organizations. A phenomenological lens has the potential to generate disruptive knowledge and expose the "steeped denial of the role of organizations in causing harm, trauma and suffering to people" (Gilpin-Jackson, 2020, p. 85). With phenomenological research, management researchers have the opportunity to up-end long standing assumptions about organizational life and open up new avenues for inquiry.

With so much hidden in organizational life (Argyris, 1993; Frost, 2003; Marshak, 2006; Schein, 2017), it is no wonder that problems persist. What might management researchers find when they explore the lived experience of common phenomena experienced by people, including traditionally marginalized people, in organizations? For example, despite the popularity and volume of research on employee engagement (Saks & Gruman, 2014), only one in five employees in Canada is engaged at work (Gallup, 2021). By inquiring phenomenologically into the experience of engagement, oppressive social structures, taken for granted beliefs about power and decision-making, and systemic biases may be exposed and challenged in a new way. Despite one hundred years of research on leadership (Barling et al., 2011), we have failed to develop innovative theory to solve our most perplexing problems (Argyris, 2010). By inquiring into leadership as a thing of experience, gendered, ideological beliefs about effective leadership, intolerance for uncertainty, and defences against shame may be exposed. Avenues of inquiry into phenomena that manifest in the lives of people in organizations are endless. In addition, with so much taken for granted in mainstream management research, vast new areas for research can

open up when they identify and bridle their own assumptions.[22] Finally, with so much resistance from management researchers to adopt phenomenological research, what might be hidden in their experience of having their assumptions challenged? I offer that shifting away from their positivist and post-positivist paradigm will reveal the sordid, toxic, oppressive dimensions of modern organizations and they will suddenly be faced with the moral obligation to address the injustices that their paradigm had been shielding them from.

Conclusion

This article introduced phenomenological methods for management researchers who might be longing for a new way to understand their most perplexing problems. It demonstrated, in accessible language and through a detailed description of one research study and its researcher's reflection-in-action, that phenomenological methods can be used to inquire into the everyday, ordinary lifeworlds of people in organizations to find what is often overlooked. Although this article represented a first date, phenomenological researchers who are attracted to it will require they get to know it much better and eventually, make a full commitment. This commitment requires researchers to shift their paradigms to a phenomenological one, where they promise to passionately pursue a greater understanding of phenomena, become increasingly aware of their pre-understandings, and acknowledge and bridle their judgments. In return for their commitment, they will be rewarded with the possibility of discovering insight into problems, like the study presented here, that challenge common perceptions about persistent problems in organizations. Most importantly, shifting to phenomenological methods and being

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[22] For a sample of assumptions held by management researchers about leadership, see Alvesson and Sveningsson (2003).

deeply curious about the lifeworld of work provides the opportunity to create more humane workplaces.

CHAPTER 3: AUTOETHNOGRAPHY

How to be Good: One Woman Engineer's Experience of Suffering in the Workplace

This chapter represents a manuscript that is currently under review for publication. As discussed in Chapter 2, the purpose of this autoethnographic study was to inquire into my own experience of the phenomenon under study. Since I had experienced suffering in the workplace as a woman in engineering, it was important, for methodological reasons, to get in touch with my pre-understandings (Dahlberg et al., 2008). One way to do that is through autoethnography (McIlveen, 2008).

As I studied autoethnography's methodology, and particularly the works of Ellis et al. (2011), Muncey (2005), Pelias (2013), and Spry (2011), I began to shift my perspective from blame to a systemic view of my experience. I began by identifying moments in my life that seemed to have marked me. Many of them were moments that I had discussed with my personal coach because they seemed to be linked to areas in my life that I still found challenging. Encouraged to *show* and not *tell* (Ellis et al., 2011), I began writing about each one. I tried to put myself back into that moment. I imagined myself as a young girl in my childhood home, looking up at my young, athletic father. I imagined myself in a university classroom, observing a chaotic scene. I imagined myself in my workplace, anticipating a reaction from my boss. For each snippet, I tried to get in touch with my feelings and thoughts in the moment. My first drafts were at times superficial. I re-read them and added more detail, more depth. One story, however, even made it to my supervisor for review before I noticed I had been lying to myself. As you will read, I judged my fellow engineering students harshly when they had not done as well as me on an exam. Instead of feeling bad for them as I watched our professor humiliate them, and as I

initially wrote, I thought they deserved the dehumanizing display. Shame had kept me from my truth.

I write about one pivotal moment in my autoethnography inquiry when I suddenly realized my response of thirty years ago was not what anyone else would have done. For me, shutting down and moving to silence was the normal, natural way anyone would have responded if an older, male relative scolded them for crossing a line. After all, I should have known better than to embarrass a man by knowing more about physics than him. While doing autoethnography, with self-blame out of the equation (Spry, 2011), I saw what had been the invisible role that gender, culture, and power played in this interaction. Fascinated, I developed a deep sense of curiosity about what was hidden in my experience and eventually the experiences of my participants.

As I fleshed out my stories, I developed the metaphor of the landmine field. I had discovered the metaphor as I worked with a personal coach. With a superficial understanding of the metaphor, I had used it to describe my way of being in the world, i.e., life is like a landmine field. For the autoethnography, as I learned about landmines, the metaphor deepened. For example, I did not know that landmines were initially used to protect important assets. Knowing that some of those early landmines that I hit were placed to protect me gave me empathy for those who had placed them. Learning that landmines were later dropped randomly to terrorize, helped me understand my increasing distress of my early work experience. The landmine metaphor became the thread that tied my experiences together and gave me phenomenological sensitivity for my participants' stories, where our experience of the present "is always meant as having an endless *past* behind it and an open *future* before it" (Husserl, 1936/1970, p. 160).

Abstract

In this autoethnography, I explore my experience of suffering in an engineering workplace. I first reflect on the self-blame that stealthily dominated my experience up until this study, where I now "interrogate the historical, cultural and biographical conditions that moved [me] to experience the events being studied" (Denzin, 2013, p. 125) without blame (Spry, 2011). I introduce the metaphor of a landmine field to explore and convey my lived experience. I share snippets of stories of my life on a landmine field and intersperse them with reflections on the meaning I made of those moments. I recall the shock and confusion I experienced as a child when I recall learning that I was on a landmine field. I then recount moments in my early life when I mapped out the landmines as I learned how to be "good" in order to stay safe. This mapping out of the terrain continued, almost without my awareness and as my stories depict, as I studied engineering and skillfully navigated my way through its gendered culture. The autoethnography culminates in my experience of suffering in the engineering workplace, told through stories that illustrate my increasingly distressed attempt to be "good." However, unlike earlier experiences where I had tacitly learned to predict where the landmines were and confidently navigate them, I found myself trapped and suffering on new terrain while my usual methods of staying safe failed me.

Keywords: women in engineering, suffering at work, autoethnography

Introduction

It was the anniversary of the École Polytechnique Massacre, where fourteen women were killed in Montreal. Most of them were studying engineering and were killed in their classroom after being separated from their male classmates. "You're all a bunch of feminists," I recall the gunman reportedly saying before opening fire. On this thirtieth anniversary, there was a media

campaign to highlight the stories of thirty accomplished women engineers. Thirty photos of successful women. Thirty lists of credentials and accomplishments. This official version of women in engineering, thirty years after I had been an engineering student and a budding feminist, left me feeling on the outside and alone. Like Muncey (2005), "I found my story conspicuously absent" (p. 69).

The Story I've Been Telling

In this autoethnographic text, I will first share the story I've been telling for many years. I've come to learn that it's a story that helps me maintain the illusion that I'm facing my experience head on while simultaneously reinforcing my deep-seated belief that life is like a landmine field and I need to be very careful.

In one of my first engineering jobs after graduation, I worked for an asshole for fourteen months. In those months, I went from being confident and hopeful to depressed and anxious. I then sat on my couch for six months before going to therapy and beginning my lifelong crawl out of that hole.

I've been using the word "asshole" (said with emphasis) to demonstrate my strength. You see? I survived. I also describe the dramatic shift to "depressed" and "anxious" (said with dead seriousness) to convey the gravity of the damage inflicted. I was someone special and I was hurt, badly. I then try to lighten the story with "sat on my couch" and continue to do so with my tone when I reveal the word "therapy." The damage needs to be attended to - obviously. Finally, I add "my lifelong crawl out of that hole" because I want them to know I'm still vulnerable. Please don't hurt me.

That's the story I've told myself and others for close to thirty years. But the story is more complex, of course. Publicly, I blamed my boss for my suffering. Privately, I beat myself up. I

cared too much about what he thought. I was not strong enough to cope with his criticism. I was flawed in some way that made me particularly vulnerable to his reproach and the suffering that ensued. For thirty years, in my effort to "crawl out of that hole," I have been fundamentally asking myself the same self-blaming question, "What is wrong with me?" This autoethnographic text rejects that approach and represents my effort to describe and understand my experience more fully, without blame (Spry, 2011) and by "interrogating the historical, cultural and biographical conditions that moved [me] to experience the events being studied" (Denzin, 2013, p. 125).

In support of my upcoming phenomenological study of suffering in the workplace in the context of women in engineering, I will, as is essential to phenomenological methods (Dahlberg et al., 2008; Vagle, 2018) gain a deeper awareness on my pre-understandings of the phenomenon before beginning the data collection. For those researchers like me whose personal experience is relevant to their research, McIlveen (2008) suggests using an autoethnographic approach "as a means to operationalise the notion of critical consciousness within researchers and practitioners" (p. 1). In other words, this autoethnographic study is my attempt to probe my experience of suffering in the workplace as I prepare to investigate the lived experience of others who have experienced the same phenomenon.

Although this autoethnographic text began as the fulfilment of an academic requirement, it transformed into a project of deep curiosity about self and meaning making, as Turner (2013) remarks often happens. It became a way to "critically reflect on my own pain" (Spry, 2011, p. 36) and inquire into the new meaning I needed to break open in order to heal. This work became so personal that, at times, I wondered what possible value it might have for anyone else. But, with its focus on linking the personal with the cultural (Adams et al., 2015; Holman Jones, 2005;

Spry, 2011), I began to understand the power of autoethnography to surface and challenge the broader cultural and social aspects of individual experience.

My story is one that I find uncomfortable to convey as "research," given my early beliefs about scientific knowledge. As a young engineering student who had not yet examined her own epistemological assumptions, I found comfort in the "right" answer, in logic and detachment, and in deferring to the expert voice. Part of engineering students' process of professional socialization involves learning to project confidence and to be strongly united (Dryburgh, 1999) and I joined in the feeling of pride, and even superiority, that comes with being an engineer. At the same time, I brushed off my own feelings, joined in engineering's male-dominated culture, and kept silent about my vulnerabilities.

Now, in contradiction to all I learned about knowledge as an engineer, autoethnography invites me to value and examine my deviant case (Muncey, 2005), to embrace the messiness of my memory (Muncey, 2005; Giorgi, 2013), to focus on "intimate and close-up perspectives" (Adams et al., 2015, p. 23), all with humility (Pelias, 2013). Autoethnography invites me to explore how my personal history is "implicated in larger social formations and historical processes" (Muncey, 2005, p. 2) or as a tool for cultural criticism.

Autoethnographies invite the reader to "experience an experience" (Ellis, 1993, p. 711) of those that are often "shrouded in silence" (Ellis et al., 2011, "1. History of Autoethnography" section, para. 3). As so often is missed in mainstream organizational science, autoethnographers believe that "the literary has the potential for putting flesh on the skeleton of abstraction, for bringing the affective into shared space with the cognitive, for revealing the human heart" (Pelias, 2013, p. 385). In this way, autoethnographies emphasize showing and not telling (Ellis et al., 2011). They are intended to be aesthetic in nature (Adams et al., 2015; Andersen & Glass-

Coffin, 2013; Ellis et al., 2011; Spry, 2011), evocative (Ellis et al., 2011; Holman Jones, 2005; Pelias, 2013), and open ended (Andersen & Glass-Coffin, 2013). At their core, they offer the possibility of transformation, both personal and cultural (Berry, 2013; Custer, 2014; Holman Jones, 2005; 2016; Spry, 2011).

My story centers around, as autoethnographic texts tend to do, an epiphany (Adams et al., 2015; Ellis et al., 2011; Denzin, 2013) or "events, after which life does not quite seem the same" (Ellis et al., 2011, "2. Doing Autoethnography" section, para. 2). My experience of suffering in the workplace was my epiphany and "a defining experience in my life" (Muncey, 2005, p. 70) that continues, years later, with my "current preoccupations with that experience" (p. 70). I will tell you my story of suffering in the workplace by taking you, the reader, through essential "snippets" (Giorgi, 2013) of my life with the aim of illuminating the covert cultural dynamics of my lived experience (Holman Jones, 2005), while "telling the truth, as I understand it" (Pelias, 2013, p. 388).

The New Story – Learning to Live on a Landmine Field

Initially, landmines were used as a defensive tactic (International Campaign to Ban Landmines, n.d.). They were placed strategically to protect important assets and restrict the movement of others. They were developed to maim rather than kill, so as to focus the target's resources on fixing themselves rather than on fighting back. In those early days, the landmines were mapped out methodically and their locations were shared with friendly forces to help them stay safe. However, over time, landmines were used in internal conflicts to terrorize communities and control movement. They were often dropped from above by airplanes and, without clear patterns or warning, innocent people suffered as navigating the terrain became increasingly threatening and psychologically damaging. Residents' movements became more and more

cautious so as to avoid the danger. A new form of suffering emerged where fear, anxiety and guardedness dominated life and left little room for everyday joy, creativity and dreaming. The land ultimately became uninhabitable.

As children do, I initially learned how to behave at home. Some memories stand out more than others. Taken together, there was a pattern where I felt loved and cared for when I was "good" and where love was seemingly withdrawn when I was "bad." One memory is particularly vivid.

As a young child of five or so, I hated my father smoking. I asked him to stop many times to no avail. One day, I took his cigarette pack and broke what cigarettes remained inside. I thought I was so clever. At least for today, he would have to stop. As he opened the pack, I waited in anticipation. I easily confessed when he asked who had broken his cigarettes. Surely, he would see how much I loved him and be tickled by my ingenuity as he often was. That's not what happened. Instead, his demeanor shifted abruptly from disbelief to furious. His sudden anger shocked and confused me. He had transformed swiftly into a man I didn't know existed. My slight body stood silent and motionless in the shadow of his tall, athletic frame, as if paralyzed and powerless, as he berated me. Then, almost as suddenly as his anger had arisen, he withdrew to another room, and I was left alone to make sense of what I had done wrong.

This is the earliest memory I have of learning that I was on a landmine field. I understood that one small misstep on my part, however well intentioned, could cause an explosion and I would be left alone to make sense of what just happened. To protect myself from further harm, I began mapping out the terrain.

I looked out the window as my brother mowed our backyard lawn with my father. I sat there, feeling powerless and a little numb. I wanted to mow the lawn. I wanted my father to have

confidence in me, to teach me, and to delight in my skillful handling of the machine. I had asked him many times before if he could teach me how to mow the lawn. Despite that I was strong, athletic, and only eighteen months younger than my brother, his answer was always the same, "no, you're too young to mow the lawn - it's too dangerous for you." No matter how much I protested the unfairness, he would not relent. This last time I asked, he grew impatient and his tone said, "don't ask me again" and I didn't.

I didn't always have to stumble on landmines to know where they were. My father often pointed them out to me, and I paid close attention.

"When you go outside this house, remember, you're a Howard," my father often said to me. Howards were good. They followed the rules. They did well in school. They didn't talk back. They never spoke badly of anyone, especially family members. They didn't get caught up with the latest trend nor succumb to peer pressure. And they definitely didn't lie, sneak, smoke, drop out of school, or live with their boyfriends, as so and so had.

My mother also helped me map out the landmine field.

Predictably at six o'clock, as my mother was making supper, the front door opened and there was a frenzy of excitement in the house. I jumped a little knowing my father was arriving home from work. I hoped that he might be up for some fun, like the time I sat on one of his feet, wrapped my legs around his, and held on tight while he pretended to look for me around the house. That evening, like so many others, he walked through the door in his suit and tie and with his shoulders somewhat slumped, as if depleted by the day. I hung back, fidgeting, as I controlled my eagerness to run to him and hug him. I watched my younger sisters rush to him only to be dispirited by my mother. "Leave your father alone, he's tired," she scolded in her familiar tone.

He didn't say much more than a brief hello as he slipped into the house and upstairs to change his clothes and "relax" before coming down for supper.

I learned to control my impulses and prioritize his needs to avoid landmines.

Good grades and academic performance guaranteed avoiding landmines at home. However, I found new landmines at school.

Growing up in the 1970s in Quebec, my unilingual English-speaking parents were eager for me to learn French. After enjoying kindergarten in English, I was moved to a French school in grade one. My new teacher seemed annoyed to have to speak to me in English when she found me completely lost. I recall approaching her desk one morning during class. Before I knew it, she grabbed my hands and pulled them towards her for a closer look. Loudly and in English, she berated me with disgust, "Look at your fingernails. They are so dirty. How could you come to school without washing your hands?" With each word, delivered in the sharp, rough rhythm of her heavy Quebecoise accent, I felt exposed and defenseless. Stunned, immobile, and trapped in shame, I waited for her to finish and then slinked back to my desk, avoiding my classmates' collective gaze along the way.

This teacher became someone to be careful of and, with no one at home who spoke French and could help me with homework, I learned to struggle alone.

Once I became a student in engineering, I found my self-worth and sense of belonging increasingly linked to achievement and performance as I continued to map this new terrain.

I immediately noticed the pile of graded mid-term exams sitting face down on the professor's desk as I entered the large auditorium. This course was the defining first-year one of mechanical engineering and I could sense a nervous energy in me and in my one hundred or so classmates as the room filled. As class begun, the professor picked up the large pile and

announced that the papers were ordered from highest to lowest marks and would be returned in that order. "The highest grade is … and the lowest grade is ... I'll hand the first paper to the top student and then throw the remainder." I sat there, riveted. True to his word, he first called out the name of the student who had achieved the top mark. Once he found the student, he made his way to the student's seat, looked at him as if to take in his face, and handed him his graded exam. Then, one by one, he called out the remaining students' names and returned our papers. I was next to be given my paper and I noticed that he approached me, looked me in the eye, and gently tossed it to me, as if to signal I had done well and was not in the same class as the remainder of the students. I was caught up in my own achievement and sense of belonging, as I recalled what he had said in our first class, "Look to your left. Look to your right. One of you will not be here at the end of the semester." The professor continued to distribute the papers. The flurry of thrown papers intensified and eventually captured my attention. It was a wild scene, with his bellowing voice filling the room and students climbing over chairs to pick up their papers. In that moment, I judged my classmates by their relative grades. If they had not done well, then maybe they weren't meant to be here. As the pile of exams got smaller and smaller, the professor finally tossed the last papers on the floor as if they were garbage. Whew! Danger averted – for me. If others were injured in the attack, then they hadn't been careful enough.

I became known in my circle of friends as the one who reliably went to class, took great notes, did all the assignments, and excelled in some of the most conceptually difficult classes.

For one assignment, I worked over several days creating a technical drawing by hand of an isometric view of a complex mechanical part. On this day, as I worked alongside my classmate and continued to replicate the challenging angles, I sketched, and I erased.

Eventually, the changes were numerous, and the erased marks stood out to me as sloppy. I started over with a clean white sheet. My classmate, whose assignment was not as advanced as mine, appeared dumbfounded. "It's good," he insisted, "you don't need to start over." Unpersuaded, I offered him my abandoned drawing, which he cheerfully accepted, completed, and submitted as his own.

Avoiding landmines meant performing academically but it also meant tolerating overt sexism.

It was my first week as a first-year mechanical engineering student when I was given a tour of the mechanical engineering lab, a room filled with large metalworking tools and the unfamiliar smell of cut metal and coolant. The tour was given by one of the several lab technicians, who all seemed at ease and even smug in what seemed like their space. Our guide was middle aged, wore a well-used lab coat over his big belly, and spoke with a hint of contempt for this latest crop of students. I listened carefully, already worried about making a misstep when it came time for me to eventually use the machines. One classmate talked excitedly about the hours he had spent using many of the same tools as a hobby. As the only woman in my group and as someone who hadn't even been allowed to use the lawnmower, I was silent throughout the tour as I put my energy into not standing out. My tacit, guiding principle was to not give anyone any reason to think I was uncomfortable or that I didn't belong. I remained silent and pretended to not notice the nude calendars, presumably customary gifts from equipment vendors, hung up in more than one technician's cubicle.

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I had heard about the Plumber's Pot, a student run newspaper that had been banned by the university the year before I became a student. It was juvenile, misogynistic, and notorious. It

portrayed engineers as horny, virile men and women as brainless, compliant bodies. Now, sitting in the student lounge, I saw that an "underground" copy of it was circulating among students on the other side of the room. With one eye on them while I pretended not to notice, I sensed pride and defiance in those students who I presumed were the authors. Others laughed.

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In class, on numerous occasions, one professor said, "you'll know that you understand something when you can explain it to your grandmother." Makes sense I thought then, before catching myself and reflecting more critically on the sexist nature of this "wisdom." I went over it in my mind. What if one were to replace the word "grandmother" with "grandfather"? It just didn't have the same meaning. What other word could be used to convey the same message? Naïve? Simple minded? Uneducated?

Throughout my years of study, there was an ongoing narrative about what it meant to be a "real" engineer. Although not easy for me to define today, there was an unmistakable masculine quality and a swagger about being a real engineer. With roughly ninety percent of the student body being men, masculinity was simply the air we breathed. While with my friends in engineering, whether in the library or off-campus, I was often singled out and asked if I was in engineering too. One men's flag football team was called the "Rigid Members" and the season was celebrated at the Flagball Awards Gala, or "F_G-nite," with defiant pride. Students seemed to strut as they walked into on-campus parties with their hand-painted lab coats and their hard hats adorned with "love an engineer" stickers and beer drinking systems. Those who grew up tinkering with machines and electronics were more like real engineers. By being "book smart," I was valued when help was needed on an assignment but otherwise that expression was a running

insult directed at no one in particular. Arts students, referred to as “artsy’s,” were made fun of regularly.

In what might seem contradictory, I was proud to be part of engineering. I felt a great sense of belonging that I hadn’t felt before. Now, looking back, I realize that I had learned to perform and enjoy being a female version of a real engineer while also doubting, covertly, that I could ever really be one.

I was the quarterback of my intramural flag football team, the “Loose Screws.” My all-woman, all-engineering team had just won the university-wide championship on a mud-filled field in the rain. As I walked through the campus with my teammates, each of us covered in mud, I felt as if I could conquer the world!

As I gained confidence and picked up the swagger of engineering, I began openly advocating for the inclusion of women in engineering. In many ways, I did experience a great sense of belonging and I wanted more women to have the same opportunity I had. If only more women were exposed to engineering and some evident changes were made, then more women would have the same great experience I was having. I became a member of an all-women faculty committee whose mandate was to promote opportunities for women in engineering. (Ironically, the only faculty on the committee was a professor of computer science because there were no women faculty in engineering.) Our focus was on increasing the number of women in engineering by promoting engineering as a career path for women and eliminating barriers. With women making up only ten percent of the student body and not one woman on the faculty, our mandate was uncontroversial.

Just as I was gaining a sense of independence and activism in my life, the École Polytechnique Massacre happened on December 6, 1989, at 5:10 pm, when a gunman targeted

women engineering students and killed 14 women. Before opening fire, the gunman reportedly described himself as against feminists – against women like them. One women student tried to save their lives by denying they were feminists and explaining that they just wanted to study engineering. The violence against those 14 women felt personal. It reminded me, in a visceral way, of those moments when I thought was safe enough to be bold, only to feel shaken to my core with the realization that I should have been more careful. It reinforced that I was on dangerous territory.

Several of us engineering students gathered when we heard the news. It had just happened on the other side of Mount Royal from us. The same snow was falling on us as was falling on the first responders and reporters. I arrived dumbfounded and ready to talk about the unbelievable news. Instead, one of my close friends made a juvenile but seemingly harmless joke about it that I don't recall. I interpreted his joke as "we're not going to talk seriously about this" and with that, I was left alone to process what had happened. Anyway, we had our final exam in solid mechanics the next day.

With my friend's joke and the rest of our shared silence in response, my circle of friends tacitly agreed that we were on our own cultural island and that the massacre and the culture that it arose in had nothing to do with us. Any other narrative was undiscussable.

However, the contempt for women in engineering was not the exceptional sentiment of a madman.

Shortly after the Polytechnique Massacre, I was celebrating the holidays with my extended family. During what I thought was an unremarkable conversation, an older family member described the physics of a golf swing and I corrected him. Without comment or attracting any attention, he swiftly and deliberately made a gun with his fingers, pointed it at me,

and pulled the trigger. My reaction was immediate and instinctive. The life drained a little from my body. I experienced a shift within me from eager and spontaneous to flat and controlled while I said nothing. I had crossed a line. I focused my energy on not reacting outwardly. If others in the room saw what happened, they kept silent too. I didn't speak about it for thirty years.

This experience never puzzled me until I began analyzing it by writing this autoethnographic text, where "*doing* ethnography is inseparable from *writing* ethnography" (Adams et al., 2015, p. 47). To me, at the time, the scene played out only as it could have. To me, I interpreted his gesture and responded exactly as anyone would have. Now, as I inquire into this experience through a cultural lens, I ask myself, what had I learned leading up to this experience that led me to respond this particular way? What had he learned that led him to want to make such a gesture in the first place, and then to know, presumably, that he could do so with impunity? For the first time, I could see options that I had been invisible to me.

How could this have played out differently? If I hadn't learned to be "good," to dismiss my own needs, and to avoid upsetting the status quo, I might have called attention to his gesture. I might have asked him what the hell he meant. I might have blasted him for his disgusting expression of misogyny. I might have written about it and begun a public conversation about the lived experience of women in engineering at a time when the media was focused on gun control and violence against women in general, while virtually ignoring the conversation about women in engineering. Alternatively, had I been born in the body of a "real" engineer, he likely never would have made the gesture in the first place. Going even further, he likely never would have even dared make his uninformed statement about the physics of a golf swing had I been a man studying engineering. As it did play out, I stayed silent and did not even consider any other

options. My silence and self-control were so much a part of me that I didn't even realize that I kept this incident a secret as I hid in plain sight as a woman in engineering.

I kept more secrets as I approached graduation and was looking for a job. I had never had a summer job with relevant engineering experience. Frankly, I hadn't looked that hard. Those jobs seemed to go to people who had connections or who presented like real engineers. As I graduated, my prospects in the economic downturn of the early 1990s relied on my strong academic record (my book smarts) and my engagement in student life. I had few specific aspirations other than to learn and grow as an engineer and to eventually be an engineering manager.

I had an interview for a job at a quarry. It was a filthy, isolated place where I was proudly told that they crushed rocks this way, and that way, and even other ways. After the tour of the plant, the hiring manager and I met in his office. He told me if I were hired, I'd be the most senior person on the night shift and the only woman. I bristled at the thought, but I tried not to show it. He then added that he couldn't guarantee that I would not be verbally assaulted, saying out loud only a bit of what I was already imagining. I simply nodded as if it was a normal aspect of the job and to be expected. At that moment, I decided I would never work there but, instead of saying so, I smiled and let on that I was still interested. With his honesty, I sensed that he was genuinely trying to be more inclusive of women. I also imagined, in that moment, that if I were equally honest, I would close the door for all women.

The New Story – The Terrain Becomes Uninhabitable

After graduation, I started navigating new terrain without any awareness of all the cultural learnings I had accumulated.

Early in my career, as I began a new job, I was hopeful and excited. The company was a small start-up, and my new boss was an ambitious business leader and engineer.

He gave me everything I needed: an office, business cards, a computer, software, a good salary. He took me under his wing, giving me training, responsibilities, and challenging work. He was generous and kind - almost fatherly. He said he paid me a very good salary because he expected a lot from me.

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I was tasked with simulating traffic using a new and cutting-edge simulation software. This involved me converting, often manually, sample data, representing hundreds of routes, into a format demanded by the software. The task was painstaking, and the early version software was unforgiving. If I didn't format the extensive raw data properly, there would be errors, or the simulation would not run at all. In my boss' office, he asked about my progress. I was honest and shared where I was and the challenges I was facing. His face suddenly turned from soft to hard. "Never say you don't know how to solve a problem," he lectured me aggressively while I heard that I wasn't behaving like a real engineer. "Mistakes kill," he added. I stood there, listening and acting as it what he was saying was reasonable. In response to him, on the outside, I might have said, "OK, thank you, I'll keep working on it." On the inside, I was scared and began recalculating, like google maps does when you go off course. The new directions told me to keep my mistakes to myself and not expose my work in progress. In my recalculation, I looked for new ways to avoid the landmines.

A pattern emerged where my boss was ostensibly kind and then withdrew that kindness the moment I made a mistake or didn't behave to his standards. Since I had had always been successful in meeting others' standards as a means to avoid landmines, I expected to be able to

navigate my way around these new ones by stepping up my usual strategies: work hard, avoid conflict, meet the others' needs. I became hypervigilant. I over prepared. Going against what I thought was the right way to collaborate, I dared not show him my work in progress. Since I had already learned from him that I was not to say that I didn't know the answer, I dared not reach out for help. I worked alone.

Even with these reinforced strategies, I was only marginally successful in avoiding his unpredictable and unavoidable landmines. Specific memories of hitting smaller landmines, where his demeanor or tone of voice may have shifted threateningly, aren't accessible to me after almost thirty years. Instead, they are a blur in the background with my familiar anxiety and suffering taking center stage in my memory as a bodily sensation. Tension in my neck and shoulders washes over me even today when I am triggered by a similarly threatening situation and I suddenly feel fearful and fragile.

In one of the few examples of hitting landmines that comes to mind after all these years, I found myself determined to preserve my integrity while knowing that I was risking hitting a landmine. I had been on the job about three months.

My boss asked me to work an extra two days on an upcoming weekend because a colleague was coming in from out of town to work with us. He had made it clear that my salary was on the high end and that meant that I was expected, as real engineers were, to work extra hours when necessary. I agreed, but with the caveat that I had to leave at five o'clock on the Saturday night because I had plans. "No problem," he said. I felt justified in setting a time boundary for our work because it was my birthday. Out of principle, I withheld that information. I shouldn't have to justify being unavailable on a Saturday night when I was going to be working all weekend, I thought. In addition, I didn't want to experience any disingenuous warmth or

affection from him once he knew it was my birthday. As the weekend approached, I became increasingly anxious about having to leave at 5:00 pm. Despite how easily I could have eliminated my anxiety by telling him it was my birthday, I kept it to myself. The weekend of my birthday came and, as the clock moved closer to five o'clock, I could see that the work was not wrapping up. Either he had forgotten my boundary, or he hadn't intended to respect it. I was scared of his reaction but resolute. I reminded him that I would be leaving shortly. As I feared, he became upset. Shifting from friendly and collaborative to cold and aggressive, he lectured me about professionalism and loyalty. I listened and I apologized but stubbornly left. Once in my car, I began to cry and cried most of the way home. Once there, my husband was concerned and somewhat frustrated with me, asking if I had finally told my boss that it was my birthday, as he had suggested all along. I sobbed, explaining myself with some pride that I had stood my ground, "No, I shouldn't have to. He should respect our agreement, regardless of the reason." Without another word, he picked up the phone and called my boss. I was stunned. "Is Ann-Louise there?...No? Oh, because it's her birthday and we are just waiting for her." In that moment, my mood settled, and I was filled with the satisfaction that my boss had been put in his place. I could enjoy my evening knowing that he was confronted with his behaviour. However, during dinner that night, my boss and our out-of-town colleague showed up unannounced with a gift and big smiles. I was repulsed with him as I played along. We all smiled as I introduced them to everyone and politely thanked them for the gesture.

Eventually, I even began to risk setting off a landmine if it meant getting off the field and finding safety quicker.

It was five o'clock and I was leaving the office for the day. After a year of working with my boss, I found it increasingly taxing to control my anxiety in the office and looked forward

each day to some relief once I got into my car and drove out of sight of the office. On this day, despite feelings of guilt, I had calculated that I could get away with leaving at five o'clock given that I needed to have dinner before going to a three-hour, work-related training course that evening. As I made my way to the exit, hoping not to run into my boss, he approached me with what seemed like determination and I stopped, bracing myself by going a little numb inside. He came close to me and scolded me in a hushed and paternalistic way in view of my colleagues, "By leaving at five o'clock, you're setting a bad example for everyone else." While trying to appear outwardly as unperturbed, I simply reminded him of the training course and acted as if that settled the matter. My justification also implied that, were it not for the training course, it would have been perfectly reasonable for him to speak to me that way. Once in the privacy of my car and out of view of the office, I trembled at the relief of having escaped and cried tears of anger and powerlessness.

In addition to those memories, in this analysis, I recall that I also spent a lot of energy pretending that I wasn't flummoxed or rattled. It was as if my unconscious performance of self-control would somehow protect me from the shame of being incompetent, naïve, or worse, deeply flawed. In this early job as an engineer, I suffered as I silently tried to solve this puzzle that I would eventually realize was unsolvable: how to be good in the eyes of my boss.

As the months passed, I was not aware of the trap that I was in and that kept me from leaving my job. First, the doubts I had suppressed about being a "real engineer" powered my plummeting sense of self-worth to the point where I couldn't imagine being able to find an engineering job elsewhere. Any times I tentatively expressed any insecurities about my capacity to be an engineer with those I was closest to, I was quickly dismissed, with my accomplishments

and their confidence in me given up as proof of my "nonsense." These exchanges left me feeling alone and deeply flawed.

I was also trapped financially. I was bound by contract to repay my employer unknown thousands of dollars for accumulated training expenses should I leave within two years. I had signed this employment contract with the naive logic that the only reason I would want to leave my job would be for a better one and the money would not be a problem to repay. In addition, my accumulated debt was a source of shame to me. Leaving my job without another one was simply not an option I allowed myself.

Finally, in this trap, I didn't have anyone to help me. Although I complained bitterly about my boss outside of work, others' agreement that he was an asshole was only momentarily helpful. Their advice to get a new job missed the mark. Because of my boss' position in the company, there was no one I could reach out to.

The terrain had become uninhabitable, and I tried to quit, despite having no other job to go to.

I requested a meeting with him to give him my resignation. He arrived in my office with my co-worker, explaining that he wanted them there as a witness to our conversation. Although I found it odd for them to be there, I had nothing to hide and proceeded to confront him for the first time. I told him I was quitting and described the behaviour of his that I thought was unacceptable. Initially, his response was combative and intimidating. He reminded me of how much I would have to pay him should I quit. He threatened to report me to the Order of Engineers should I quit with only two weeks' notice, a notice he felt was irresponsible and damaging to his business. When I wasn't swayed, he abruptly shifted tactics and praised my work. He told me how much he valued me and how important I was to the company. He agreed

to change and asked me to stay. Earnestly hoping the situation could be rectified and eager to avoid the repercussions of quitting, I agreed to stay.

I stayed to avoid what seemed like more dangerous landmines ahead had I quit. However, he didn't change. In the weeks that followed, I continued to suffer. Sensing an opening with his threat to report me to the Order of Engineers, I made an appointment with a member there, ostensibly to ask if my boss' threat had any merit. My hidden agenda was to tell them about my boss' behaviour and ask for help.

I found my way to the sleek, downtown offices of the Order of Engineers. I felt so young as I sat across the desk from the much older, professional engineer who had been assigned my appointment. Determined to present myself as strong and confident, I told him my story by first opening with my bogus question about whether two weeks was a reasonable notice to give. As I continued with a description of my boss and my reason for wanting to leave, I fought back tears. I only recall him asking me one question, "Did he sexually harass you?" I was surprised by the question and replied that he had not. He continued, "Unless he sexually harassed you, there is nothing I can do." I don't recall what he said next, but I neither argued nor tried to persuade him further. It was clear to me that I had reached a dead end and I left feeling small and imagining that he saw me as a young woman who was too sensitive, too soft. Although not fully acknowledged by me then, beneath the shame I experienced, there was anger simmering inside me – anger that this boys' club were making the rules for engineering and that I didn't belong. To this day, I still wear my engineering ring, despite that I understood that it only be worn by practicing engineers. When asked recently why I still wear it, what I blurted out surprised me, "I earned it and those fuckers aren't going to take it away from me."

Not long after my meeting with the Order of Engineers, and while still trapped on this landmine field, I became so distressed that I was unable to function.

At home one morning, while getting ready and anticipating going to work, I broke down. It was as if an alarm was going off in my body but I had no way of escaping the danger it was warning me of. It was an intolerable, bodily sensation of panic concentrated in my arms and my upper torso that I could not suppress. I needed to escape. I dropped to the floor in the corner of my bedroom, pulled my knees close to my body, sobbed and rocked myself. My only option – to quit for real - became crystal clear.

Looking back and thinking about this moment, I notice the now familiar tightening in my upper arms, my shoulders and my chest. Today, this feeling of threat and dread lets me know that the past is invading the present moment. When I am at my best and listening, it lets me know that forces outside of me have conditioned me to search for what is wrong with me, rather than accept myself as I am and respect my own feelings and needs. However, as I suffered in this engineering job after years of pretending and neglecting my own needs, my body finally spoke loud enough for me to hear.

Hope for a Deeper Truth

Tilley-Lubbs (2016) points out that, in the present, "situations still occur when [our] reactions reflect previously forgotten and/or hidden beliefs from my cultural past" (p. 5). In this way, the metaphor of navigating a landmine field in the past came to me as I experienced the same feelings and patterns in the present.

I was having feelings of anxiety ever since I completed the course work of my PhD. With a daunting sense of what was expected from a PhD student and few clear guidelines or deadlines, how to be good became increasingly unclear. My productivity slowed. Although I worked on my

studies on most days, and even quit my job of twenty-five years so that I could be more productive, I generally delayed, avoided and procrastinated. I also worked alone, rarely reaching out for help. Over time, I completed my comprehensive exams and eventually drafted my thesis proposal. My feelings of anxiety intensified during the COVID-19 pandemic as I wrote this autoethnographic text and when I found myself without much contact with my supervisory committee. Struggling alone with my memories and with little data to assess how to be good, I worried about their judgment of my lack of productivity and initiative. I began to notice, more and more, that, when faced with anticipation of judgment and rejection, that familiar, painful feeling that I described earlier was triggered in my body and was accompanied by dread. It was beyond logic and, despite my awareness of it as a pattern from my childhood that is no longer serving me, it overpowered me. Moving fearfully and tentatively, I was experiencing doing my PhD as if I was on a landmine field without a map, just as I had so many years ago in my first engineering job.

As Denzin (2013) explains, through autoethnography, I explored the past and reimagined it within a cultural context in my effort to reveal "hidden features of the present as well as the past" (p. 126). All that is left for me now is the hope of evoking a deeper truth and new metaphor for myself and perhaps others, where one's sense of worth is not dependant on someone else. "Autoethnography can radically alter an individual's perception of the past, inform their present, and reshape their future if they are aware and open to the transformative effects" (Custer, 2014, p. 1).

Epilogue

There exist two contradictory narratives related to women in engineering. First, in an economy with an increasing shortage of engineers, there is the narrative that women are

welcome in engineering. This narrative has driven the interventions that we often see as companies, universities and professional organizations try to attract and retain women. Countless articles focusing on the accomplishments of women engineers, the numerous scholarships and awards available to young women, and the parade of events where women's successes are highlighted all dominate the narrative. At odds with this narrative is the idea of what constitutes a "real engineer." He is logical, detached, competitive, and unmoved by emotion.

My story illustrates that suffering that can take place at the intersection of these two narratives. Even today, my own doubts about this autoethnographic story live at this intersection. As I let down my guard in this autoethnography and value my story, I still wonder whether others, especially engineers, will judge my suffering as legitimate. I imagine them saying, "What's wrong with her?" or "She obviously wasn't cut out for engineering." I wonder, will they view my emotions as weakness and as the obvious reason that I suffered in engineering? Will they make new meaning after reading my story or will they continue to deny that these narratives are at odds with one another?

CHAPTER 4: FINDINGS

The Personal is Political: Women Engineers' Experience of Suffering in the Workplace

This chapter represents a manuscript that is currently under review for publication. Its purpose in this thesis is to present the findings of my phenomenological study on women engineers' experience of suffering in the workplace. To complete the manuscript, I introduce the research question, briefly review the relevant literature, and describe the methodology and methods used. I also provide a discussion of the results that, in comparison to the detailed discussion in Chapter 5, is quite brief.

Abstract

This Canadian study investigates women engineers' lived experiences of suffering in the workplace. This phenomenological study had participants provide a critical situation narrative and participate in two conversational interviews where their experiences of severe and protracted distress were explored in depth. Analysis of women engineers' intimate, personal experiences of suffering in the workplace found that women engineers who suffer are trapped in an oppressive, socially constructed reality in which they protect themselves from threats and sacrifice their dignity, self-worth, health, well-being, and job effectiveness. Systemic interventions that acknowledge and address the inequality in engineering are proposed.

Keywords: women in engineering, suffering, gendered dynamics, feminism

Introduction

On their faculty website, one of the best engineering schools in Canada highlights their "successful" partnership with a large, well-known, multi-national manufacturing company. The article touts their long-term relationship and the large number of students who have received valuable, hands-on experience during their required work terms. It highlights the company's

commitment to student experiences and profiles one woman engineer's long, successful career at the company. Like many such articles that aim to attract women engineers to a profession where they have persistently been under-represented, it presents an attractive but potentially misleading façade of the profession. The authors do not mention the suffering experienced in silence at this company by one of the women in this study while a student at this university and during her student work term. Then again, how could they even know about it when it was so well hidden?

This study aims to contribute to the persistent problem of attracting and retaining women in engineering by inquiring into the women engineers' lived experience of suffering in the workplace. Unfortunately, forty years of research and interventions aimed at achieving gender parity in engineering (Ayre et al., 2013) has resulted in marginal gains, where women make up only 24.2% of engineering graduates (Engineers Canada, 2020b) and 14.2% of practicing engineers (Engineers Canada, 2021). Once practicing in the field, women engineers experience more burnout than their male counterparts (Hall et al., 2015; Ronen & Pines, 2008) and leave for other fields at a higher rate (Hunt, 2016) in what is often referred to as a "leaky pipeline" (Faulkner, 2009a, p. 15). By understanding women engineers' experiences of suffering, we may gain insight into this stubborn problem.

Despite the attractive façade, the research is clear: engineering is a persistently male-dominated profession where up to half of all women engineers in Canada's two largest provinces reported experiencing discrimination in the workplace (Adams, 2019; Ordres des ingénieurs du

Québec, 2022).[23] Within different engineering environments (Faulkner, 2009a), there is, at minimum, a "dripping tap effect" (p. 15) of gender-exclusive dynamics that might seem insignificant but can accumulate, like micro-aggressions (Sue, 2010b), and become extremely difficult to manage and painful to tolerate. This Canadian research study aims to investigate such pain and understand women's lived experiences of suffering in the engineering workplace. It aims to help end the silence and generate insight into the systemic aspects of the profession to help reduce such suffering. It hopes that, just as research participants gained a deeper understanding of their experience of suffering, other women engineers might recognize and reframe their own suffering and know they are not alone.

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[23] Adams (2019) found that 51% of women engineers surveyed in Ontario responded "yes" to the question "In the last year, at work, have you been discriminated against, in any way, by anyone you have had contact with?" (p. 249), compared to 12% of men engineers. Ordres des ingénieurs du Québec (2022) found that 45% of women engineers in Quebec surveyed said they had been the victim of discrimination, in one form or another, during their career, a number that is three times more than was found in the general population.

Literature Review: Suffering in the Workplace

Despite Frost's (1999) contention that suffering "is a significant part of organizational life" (p. 128), there is little research on suffering in the workplace, especially that which is covert.[24]

Some management scholars simply take suffering as a given in organizations, particularly those who study compassion (e.g., Frost, 1999; Kanov, 2021), critical management theory (e.g., Alvesson & Willmott, 2012), and the psychodynamics of work (Dejours, 2006). Kanov et al. (2017) go as far as to say that suffering in the workplace is ubiquitous, a bold claim that suggests they may equate pain with suffering. Other scholars conflate it with commonplace conditions such as anxiety, depression, and job stress (e.g., Allard-Poesi & Hollet-Haudebert, 2017; Loriol, 2019), referring likely to what Cassell (1991) calls "the outward expression of the injury [to the self]…and not the injury itself" (p. 43). Finally, empirical studies of suffering, as VanderWeele (2019) reviews, tend to focus on suffering due to medical conditions or addiction (e.g., Charmaz, 1999; Hemberg, 2017).

Many studies that do focus on suffering in the workplace tend to focus on suffering that is in plain view or legitimate to discuss (Marshak, 2006), rather than something hidden in everyday, ordinary work life, as Frost (1999) suggests it often is. For example, some studies,

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[24] A search in the Web of Science citation index (core database) on May 17, 2022 on the topic of "suffering" in the category of "Management" found 2,564 citations. However, a filter of these citations by "relevance" and "times cited" found this number to be highly inflated because the word "suffering" is often used in a colloquial manner and not meant as the focus of the research or as a theoretical construct. Relevant articles that were found are cited in this paper.

particularly in the field of nursing, focus on the suffering of medical staff as they cope with the suffering of their patients (e.g., Rowe, 2003; Rudolfsson & Flensner, 2012). Other studies on suffering at work restrict their study to catastrophic loss, for example, job loss (Morse, 2000; Stein, 2001), working while grieving (Nordgren et al., 2011), or traumatic incidents (Dutton et al., 2002; Tehrani, 1998). Finally, recent interest in suffering in the workplace has been sparked by the COVID-19 pandemic's effects on workers (e.g., Butterick & Charlwood, 2021; Lage & Rodrigues, 2021; Simpson et al., 2021; Wee et al., 2021; Yuan et al., 2021; Yue & Cowling, 2021). While these studies are worthwhile, they may reflect the unstated assumption in organizations that, unless the cause of one's suffering is clearly visible and judged as legitimate, then it does not exist or is a result of personal weakness. As Charmaz (1999) asserts, suffering provokes moral judgment. Specifically, "faultless" suffering is awarded a high righteous status (e.g., being laid off in a plant closure) while "blameworthy" suffering is conferred a low, shameful status (e.g., not being able to handle job pressures). Particularly in organizations, to speak of one's suffering at work risks being seen as soft or weak (Frost, 2003, p. 13) and for men, weakness is their most powerful shame trigger (Brown, 2012).

Suffering in the workplace is sometimes equated with the common condition of burnout (e.g., Cole & Carlin, 2009), which can mask systemic aspects of suffering. Although the threshold for burnout differs widely among studies (Schutte et al., 2000), Shanafelt et al.'s (2012) U.S. study found that 37.9% of physicians and 27.8% of working adults experienced symptoms of burnout. Since burnout is an individual construct defined by exhaustion, cynicism, and inefficacy (Maslach et al., 2001), it is generally thought of as an individual issue and not a systemic problem (Moss, 2019, para. 1).

Together, researchers' systematic avoidance of everyday suffering in the workplace and their emphasis on the individual nature of burnout suggest a propensity to blame the employee for their suffering. Like other stigmatized aspects of organizational life, this neglective tendency keeps the focus away from systemic, hidden forces in organizations (Hudson & Okhuysen, 2014) and allows researchers and organizational leaders to sidestep responsibility for addressing the oppressive nature of organizations. With such a persistent problem of attracting and retaining women in engineering, this study aims to explore the experience of suffering without blaming the sufferer and to reveal what is hidden or taken for granted in such experiences, including possibly oppressive, systemic forces.

Definition of the Phenomenon under Study

Although "suffering resists definition" (Frank, 2001, p. 355), one was established for my research to clarify what the phenomenon under study was and to convey it to potential participants. The definition was derived from my personal experience of the phenomenon, informal conversations with others who had experienced suffering in the workplace, and general definitions of suffering offered by Cassell (1991), Charmaz (1999) and Frank (2001). I defined suffering as "an intensely painful experience of loss of self and powerlessness that derives from an accumulation, over time, of demeaning incidents at work and their subsequent negation and cover-up."[25] With this definition, suffering is distinct from pain and can be found in the everyday experience of work (Alvesson & Willmott, 2012: Frost, 2003).

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[25] "Loss of self" is defined as experiencing one's "former self-images crumbling away without the simultaneous development of equally valued new ones" (Charmaz, 1983, p. 168)

Research Methodology

This Canadian study aims to investigate women engineers' lived experience of suffering in the workplace. The specific research question is: how does suffering in the workplace manifest for women in engineering? The study uses a reflective lifeworld methodology (Dahlberg et al., 2008), a qualitative, phenomenological research approach characterized by a balance of openness and creativity with scientific rigour. The goal of a phenomenological study is to inquire deeply into the lived experience of the phenomenon to find what is hidden or taken for granted in the experience and generate insight. To do this, the methodology calls for the researcher to explore the pre-reflexive experiences of participants' (descriptions of their *lifeworld*) with a *bridled attitude,* a reflective stance where the researcher strives to become aware of their pre-understandings and hold them loosely in order to "see" what might otherwise remain hidden (Dahlberg, 2006).

Choosing the Phenomenon and Preparing for the Research

The phenomenon under study was chosen, as Vagle (2018) recommends, because of my passion and interest in the phenomenon. Having experienced the phenomenon myself, I knew it well. However, this first-hand experience heightened the risk that I might share what my participants take for granted and limit what might be discovered. In other words, I may not notice hidden aspects of my participants' experience because they seem so "normal" to me. To mitigate this risk, I journaled and conducted an autoethnographic study of my experience (McIlveen, 2008), a form of inquiry where the historical, cultural, and political conditions that lead to the experience are explored (Denzin, 2013) without self-blame (Spry, 2011).

Choosing a Sample

Six women engineers were chosen as participants using a purposeful sampling method (Polkinghorne, 1989) and are identified in the findings below by their pseudonyms: Gabrielle, Christina, Joan, Purl, Nicki, and Diane.[26] They each self-identify as having experienced suffering in the engineering workplace in Canada, using the definition above as a guidepost. Conversations with the participants confirmed they were able and willing to share and explore their experience in depth with me and to do so in English. Further, each participant had been out of the work context in which they experienced the phenomenon for at least one year. This last criterion served two purposes: (a) to reduce the risk of their participation causing emotional distress, and (b) once out of the context, their suffering may be more apparent to them (Charmaz, 1999).

In addition, participants were chosen to represent a rich variation of experiences (Vagle, 2018). They came from a variety of engineering disciplines (metallurgical and materials, mechanical, civil, reservoir, and electrical), racial identities (white, Chinese), ethnic identities (English Canadian, Asian Canadian, French Canadian), sexual identities (straight, gay), and ability status (able bodied, neuro divergent).[27] In addition, at the time the experience of suffering in the workplace happened, they represented a variety of years since they received their bachelor's degree in engineering (0-10, 11-20, 21-30), size of companies worked for, measured

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[26] The findings below also include pseudonyms of colleagues, where relevant to include.

[27] Although the six participants, as a collective, met the criteria developed for a rich variation in experiences, only one person identified as a person of colour, one person identified as gay, and one person identified as neuro-divergent, despite focused efforts to reach more women with intersectional experiences.

in number of employees (11-100, 101-500, 501+), industries (mining and metals, manufacturing, engineering consulting, telecommunications), and Canadian provinces (Alberta, Ontario, Quebec, Nova Scotia). Once data collection began, I also found that the circumstances of their experiences varied greatly.

Ethical Safeguards

Given the sensitive nature of talking about their experience of suffering in the workplace, the primary risk of participating in the research was that the participants would experience emotional distress. To manage this risk, several safeguards were put in place. First, a list of mental health and wellness resources was provided to participants before the research began. Second, in all interactions with participants, I strived to communicate with care and non-judgment. Third, a protocol was developed to handle distress of a nature that is expected for such a topic (i.e., crying) that might arise during the interviews. Finally, should participants experience distress during an interview that is beyond what would be expected in an interview for such a sensitive topic, such as uncontrollable sobbing, an inability to speak, shaking, having difficulty breathing, being agitated, etc., then I would stop the interview and the participant would be encouraged to contact their mental health provider, or the crisis contact provided on the list of resources. During the research, participants did experience some expected emotional distress, with many crying during the interviews. However, they consistently said that participating in the research was helpful and worthwhile.

Data Collection

Research participants were asked to provide one critical situation narrative (CSN) and participate in two in-depth, reflective lifeworld interviews (Dahlberg et al., 2008). Instructions, inspired by Dahlberg et al. (2008) and van Manen (2016), asked participants to describe a vivid

memory of an incident in the workplace that contributed to their suffering (see detailed instructions in Table 2). Not only do such written narratives invite the research participant into a reflective stance (Dahlberg et al., 2008), but in this case, they served as a starting point and a guide for the subsequent interviews. In addition, based on my own experience and the experiences of others with whom I have spoken, there was a common concern that a listener might not believe the depth of suffering that was experienced. By asking for these narratives, I aimed to put participants at ease and build their confidence that they would be believed during the interview.

Table 2

Critical Situation Narrative: Instructions for Participants

Select a meaningful and vivid memory of an incident in the workplace that contributed to your suffering.

1. Please write a direct account of this personal experience as you lived through it (in the first person). Write as concretely, precisely and with as much detail as possible. As much as possible, avoid vague generalizations, temptations to theorize, political correctness, etc.
2. Describe the experience from the inside, as it were; almost like a state of mind: the feelings, moods, emotions, etc.
3. As you focus on your particular incident, describe specific events, a happening, a particular experience.
4. Attend to how the body felt, how things smelled, how they sounded, etc.
5. Avoid trying to beautify your account with fancy phrases or flowery terminology.

Reflective lifeworld interviews are intended to be a deep exploration of the phenomenon, characterized by a sharp focus on the experience, deep curiosity, and spontaneous questions that give rise to dialogue, openness, and reflection (Dahlberg et al., 2008). Given that the experience of suffering can be thought of as a "macro moment" (van Manen, 2014, p. 34) i.e., a "death by a thousand cuts" in contrast to a "micro moment" (p. 34) i.e., an individual "cut," it was challenging to determine how to access the phenomenon. Kanov's (2021) distinction between "severe and protracted distress" (p. 86) in his working definition of suffering at work was helpful because I could focus on both the severe experiences or individual "cuts" and delve into the protracted experience. Review of the CSN allowed me to prepare for the interview. Judgments and reactions were noticed, noted, and bridled. A summary of events or "cuts" was created, and key words (including metaphors) were noted, all to be used as a guide during the interviews. The interviews were held over videoconference, audio and video recorded, and transcribed into text (automatically and then verified by me).

Data Analysis

I used reflective lifeworld interpretative analysis to generate the findings. This phenomenological form of analysis uses a whole-parts-whole method, where the initial whole is read through and taken in, then it is divided up into phenomenological meaning units, and a new whole (the findings) is generated.[28] An interpretive analysis, as distinct from descriptive analysis, is used when the experiential data alone are not expected to be sufficient to reveal the complete

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[28] Phenomenological meaning units reflect less the content of what was said and more the underlying meaning of what was said.

structure of the phenomenon and where additional data (theory, the researcher's experience, artistic expressions, etc.) are necessary to supplement the data. The goal is to develop a comprehensive and cohesive set of implicit and explicit meanings along with their intentional explanations (Dahlberg et al., 2008).

Once the text was read and re-read while recording my spontaneous reactions, thoughts and questions, it was broken into parts or meaning units. I then set aside the extensive data and reflected on them. It was as if the data were percolating inside me. I imagined what might be hidden to the participants in their experience, *as they were experiencing it.* I developed a first set of labels for interpretations, and I began to write, going back and forth to the data to identify quotes to flesh out the interpretations. I explored theory that might explain the phenomenon and added it to the interpretations. Labels changed. Interpretations combined. I reviewed the interpretations to ensure each participant's experience was reflected. Once the interpretations were drafted as a new whole, I sent this phenomenological text to all the participants for their feedback. Two of six participants responded with gratitude but no specific feedback.

Findings

The findings presented here represent what is implicit in women engineers' severe and protracted experience of suffering in the workplace. What it *means* for women to experience this phenomenon is conveyed using seven interpretations and one main interpretation and brought to life by weaving together my interpretations with participants' direct quotations.

Interpretation #1: Women Engineers Experience the Engineering Workplace as a Threatening Context where it is Not "Normal" to be a Woman.

The context of women in engineering is essential for understanding women's experience of suffering in the engineering workplace. The phenomenon manifests in a threatening context

where, despite women engineers being overtly accepted in their workplaces, it is not normal for them to be engineers. The women engineers' presence is plainly unusual in their overwhelming male environments. However, to varying degrees because engineering workplaces vary significantly in their cultures (Faulkner, 2009a; McIlwee & Robinson, 1992), the unwritten rules and their implicit threats are less obvious but ever-present. Purl describes her experience of the context. "It's like you're the contaminant, right? And so, when things are going wrong, you're the one that's the problem. It's not the context that's the problem. You're the problem. You don't fit, you're wrong."

For some of the participants in this research, they fit into these norms well and don't initially notice them or their gendered bias. For many years leading up to her suffering, in university and in the workplace, Gabrielle had "always been one of the boys." It was only when she becomes pregnant and a mother that the norms and their limiting nature are revealed. Gabrielle, admits, "Up until then, it never crossed my mind that being a woman would be something that… could affect someone in the workplace." Christina also initially finds she is "thriving in her natural environment" but experiences the dominant norms as a looming threat to her worth as she considers having children:

> And I was determined to continue down that path, to have it all, to, and to continue to fit in and be one of the guys and not be looked down on because I couldn't perform the same when I was pregnant or after having a baby.

Christina elaborates. As an Asian Canadian engineer, she found a great sense of belonging at work that she hadn't experienced before. Looking back, she wonders, "it's hard to like draw the line these days between what parts were naturally me, *really me*, and what parts of me were trying to play by the rules of the system and fit in."

In Joan's case, a change in leadership surfaces the norms. One powerful person, the chief executive officer (CEO) of her company, reinforces the norms with a heavy hand and they ripple throughout the organization. After 20 years with the company and losing her supportive manager the year before, Joan finds her significant contributions are "being swept aside." She describes multiple examples of backlash from the CEO (and his "sycophants") for speaking her mind. "I didn't even have a chance because he just didn't like me. He didn't like outspoken women." When she is not selected for a promotion despite her high ranking, she is told by a board member, "I shouldn't be expressing my discontent to management, and that it was better just to agree and smile."

For some, the norms are always clearly visible and threatening. Purl, in her first job after graduation, recalls discovering when her body did not meet the norm and her feeling of powerlessness. As a group of male co-workers pass her on the way to the plant, one dismisses her and exclaims, "This is not the job for a little 100-pound girl." Other experiences and "non-verbal slaps" make sense in hindsight:

> It's just, it undermines your confidence because you realize how they see you, and then you realize that that's what you're dealing with. And that's what you have to battle against….If you're this child, of course, they don't listen to you….Look at her, she's a child, what does she know?

Nicki, who describes herself as a male-presenting, lesbian engineering undergraduate student, describes her manufacturing workplace as one where homophobic comments are so normal that she doesn't feel safe speaking up:

> I feel like if I said something, I immediately would just get pushed out of the group and avoided, shunned, and I just know the consequences of saying something at that moment, were far too negative, no matter how much I wanted to.
>
> She compares navigating the dominant norms to trying to stay in the light of a flashlight:
>
> Like they're holding their flashlights up saying like this is where you need to be, this is how you're supposed to think, this is how you're supposed to act. And I was trying to fit in that beam, but it was getting pretty small. And I think I experienced a lot of the darkness.

Nicki describes the dilemma she faced, "So it's just, it's just clashing every day, and it's just like kind of a struggle of trying to fit in, but also trying to be genuine, but you can't be too genuine because then you don't fit in."

Faulkner (2011) argues that gender normative pressures persist in engineering due to their "sheer 'weight of history'" (p. 289). In her historical study of how technology and engineering became so enmeshed with masculinity, Oldenziel (1999) found that engineering's early struggle for respectability and higher status involved the "hardly innocent" (p. 13) exclusion of many adjacent professions that were once considered engineering (e.g., drafting, technicians, etc.) and employed women and traditionally minoritized individuals. In addition, cultural work, including songs and jokes originating in the early twentieth century, reinforced the masculine nature of the profession. Eventually, technology became "a powerful symbol of male, modern and western prowess" (p. 11).

Hacker's (1981) study of engineering professors found a bifurcation between the masculine and feminine as central to the ideology of engineering. This split, where the male's rationality and technological competence were superior to the female's emotionality and social

competence, resulted in a social hierarchy with men and male qualities at the top and women and female qualities at the bottom. Further, the early engineering "boy's club" wasn't just one of unconscious bias and stereotypes about women and science. The profession was blatantly anti-women and (closely related) anti-"artsy."

In her study of the engineering culture, Dryburgh (1999) found that, in the 1970s, engineer's white male (heterosexual) sexuality and virility were on full display with pornographic images and misogynistic chants in student newspapers and yearbooks in Canada. In my experience as an undergraduate in engineering in Canada, these anti-women, anti-artsy expressions persisted into at least the late 1980s. So many years later, despite progress, Faulkner (2011) found that women are still not the norm in engineering:

> Through numerous subtle and not so subtle dynamics, women engineers are perceived, and can feel themselves, to be not quite "real engineers" or "real women." Men engineers belong more "naturally" on both fronts, whilst women have to do additional identity work on both fronts if they are to secure their membership in the community of practice. (p. 287)

Women engineers' experience of suffering takes place in a threatening context filled with unwritten rules that came to be in their historically male-dominated profession. They are painfully reminded of the strength of those norms when they experience the threat of not meeting them.

Interpretation #2: Women Engineers Focus on Coping with the Threat in the Present Moment while Not Noticing their Evolving Suffering

The women are so focused on surviving the present threat that they don't appear to notice suffering's evolving nature. Suffering begins with an awareness of a persistent threat to self. As

time passes, suffering is endured and resisted. It peaks and subsides as the threat materializes, fades, or disappears. Regardless of how it peaks, suffering continues as a lasting impact.

The Suffering Begins. Although not necessarily framed as suffering as it is being experienced because it can slip "into the background when pressing needs and other people take priority" (Charmaz, 1999, p. 365), the interviews reveal that suffering begins with an awareness of a threat to self. Gabrielle's experience begins with the threat of incompetence and shame. After a lifetime of success in school and at work, Gabrielle describes herself as up for any challenge. "I'll figure it out. I'll make it and it'll be a success. That's who I am." When she starts a new job in a field she is not familiar with and quickly finds herself unable to "figure it out," as she always had, she experiences "a *heavy* feeling inside." She has a sense of having "big shoes to fill," after being told by her co-workers that the engineer she was replacing on maternity leave is a "superstar." While not initially framed as the threat of shame, it becomes clear as she describes walking with her manager three years later only her to be told she was being laid off:

> It was the walk of shame. I was just like, I'm not good enough. It's the rubber stamp that I was not good enough. Like there you go. You got your certificate of not being good enough. And that's what it was. And the whole time, that's what I thought but then somebody confirmed it.

Nicki recalls the sudden threat that marked the beginning of her suffering. She had become increasingly friendly with and trusting of a helpful co-worker and technician when she cautiously confides to him that she is a lesbian. For the next few weeks, his friendly visits and chats become more frequent. One day, with just his greeting, "Nicki, I gotta tell you something," she has a swift, embodied reaction. "I remember my flight or fight senses were tingling when he said that, probably because I knew it would be something inappropriate." From that moment, he

begins making increasingly disturbing sexual advances in person and, despite her discouragement, continues harassing her with sexually explicit content over social media and text message.

Joan's experience of suffering begins with a threat to her professional standing. She is experiencing a lot of stress. The environment that was once collaborative is increasingly directive. She had recently been assigned a new boss whose "inuendo" and "nuances in the way that she spoke" about Joan's team "triggered that distrust for me." When she receives text message at home from her boss asking Joan to call her, she "thought it was foreboding." She describes the feeling in her body as "existential dread" and adds, "I need to brace myself."

Living and Dealing with the Persistent Threat. The women describe their determined effort to live and deal with the persistent threat as toughing it out. To avoid the double threat of no longer meeting her high-performance standards and no longer being one of the boys, Christina powers through her first pregnancy. "I had especially, that first time, like really tried to power through. Like, I am going to continue on like nothing is happening, like I am not growing a person [laughter]." When Nicki finds herself suffering in her student work term, she counts down the days until it ends. "I just felt like, oh, because I have this escape route. I should just put up with it until I can just escape it." Reflecting on her career in engineering and all the adversity she has overcome, Diane mentions again how resilient she is. "I'm surprised I'm still here."

Joan describes the pain she weathers. "Like, so I went through a lot of you know these kind of like, you know, sad, sadness, anger, pain, like the pressure in my chest. It just all felt like

such a burden." As Gabrielle starts a new job and soon finds herself in a permanent "catch-up mode," she describes her enduring suffering and shame.[29]

> Like there's no end. It's like, I try, I tried but I just can't make it. And then just after some point you feel desperate or you feel like, you get to be very hard on yourself. It's like, am I stupid? Am I not, am I not smart enough? Am I not good enough? And am I ruining everybody's day? Or, and, you're very down on yourself.

Diane describes her experience as, "death by 1000 cuts, it's not one thing but it's this cumulative burden, this bundle that you carry" where "you beat yourself up."

The Suffering Peaks. For some, their suffering peaks when what was once only a threat actually materializes. Diane is fired, confirming that her abusive boss had the power to do so. Christina is laid off and her sense of failure at work brings up her sense of failure as a mom. "It was confirmed that I was a pretty shitty employee and part of me it felt like I've been kind of a shitty mom along the way, so I felt like a failure." Gabrielle is laid off and feels as if she is given her "certificate of not being good enough."

For others, the suffering peaks when their bodies speak loud enough for them to hear. Joan withstands tremendous stress leading up to and after her removal from her leadership position. She describes her experience of going to emergency when she feels pressure in her

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[29] Gabrielle's experience of "catch-up mode" is not unique. McIlwee and Robinson (1992) found a similar dynamic in their study of women in engineering when a woman engineer experienced a threat to her competence. When starting a new job, she initially found herself in a skills deficit. Although she learned the skills quickly, a tone had been set. "She has to play 'catch-up' just when she feels most insecure, and when others doubt her competence" (p. 118).

chest. “And I'm hooked up to this machine, and, and you know, having an existential crisis thinking that my job has actually made me so stressed out that I've had a heart attack.” Purl describes breaking down when she went to the doctor with “really bad stomach problems.” “When she asked me what was wrong, I just burst into tears.” She immediately went on sick leave and never went back to work.

Finally, Nicki’s suffering subsides when she reaches the end of her student work term.

The Lasting Impact. The suffering has a lasting impact. It takes a physical toll, including stress, exhaustion, and physical illness. It also takes an emotional toll. Many, including Gabrielle, experience a loss of confidence and self-worth. Diane describes her reluctance to take career risks, her years of trying to “keep your head low,” and her increase in self-doubt. “Is Engineering for me? Do I really belong? Should I get out? Is the mining industry for me? Perhaps I need more education?” Purl contrasts the old her before her slide into depression:

> I mean the person before I started the job was, I think, very different. I mean I was happy, looking forward to my career, you know, things are going well, my last year in university, wow, I was knocking things out of the park, you know, and that felt good, I felt confident and ready to go, you know.

After losing her job in a very specialized industry and finding one in a new industry, Joan continues to mourn the losses:

> I'm still processing that grief, in a lot of ways. I'm working in a place that I like a lot more in terms of the culture. But then, you know, I miss my old job. I miss my old colleagues. I miss being an expert and a person people respected. I miss all those things. And so, it's, you know, it doesn't, just go away. It's lasting. A lasting effect on my mental health.

Finally, as alluded to, there is a lasting career and financial impact. Nicki's experience of suffering at her first student work term means that she loses the opportunity for a permanent job after graduation, and it influences her second work term:

> It definitely impacted my confidence levels, definitely made me second guess, like almost every decision, it definitely kind of set me up for, for a little bit of a failure at my next co-op because I was not as confident, not as chatty, not as, like, I was way too emotional and stressed out, kind of a mess.

Christina takes a new job with a significant pay cut. Laid off at the beginning of her pregnancy, Gabrielle doesn't find a new job until after the baby is born. Diane describes her potential loss of income after being fired:

> You know, but I've lost all that income. Imagine if I had soared in that job, and not hit the glass ceiling, I might have ended up being an engineering manager for that company and progressed further, but instead, I kind of was thrown down.

Interpretation #3: Women Engineers Struggle Privately and Alone.

The women keep their suffering to themselves, even to the point of deep loneliness, likely because to suffer at work might be considered shameful (Charmaz, 1999) or perceived as weak (Frost, 2003). As a result, their suffering is hidden in plain sight. Some women describe moments of confiding their frustrations with a trusted female peer, but they don't share and process their painful internal dilemmas and feelings with anyone. After she was fired, Diane describes laughing and commiserating with a female friend who had been sexually harassed, joking that their dinner was paid for by her sexual harassment settlement. Christina describes venting in anger with a female colleague after she experienced a degrading remark.

Nicki keeps her suffering private and expressly describes the loneliness of her experience. First, she describes being the only woman in the department:

> To like look around the room and be like okay, yeah, I'm the only female here. I'm only like the only female in the engineering section at all, like, it's just, it's kind of isolating, it's, it's kind of like, it's a really shitty feeling, it's not very welcoming.

She continues, “I didn't really have anybody that was similar to me, which again feeds into that like, I'm different, that is extremely lonely.” On top of her feelings of isolation, when she is sexually harassed, she doesn’t share her experience with anyone. She suffers alone. “I think that dark time felt very lonely. I think it felt almost like alienating, like it's it made me feel like I was the problem, like I was the issue, like I am the odd person out.” She describes the loneliness of suffering in plain sight of her father, who also works at the company. “It made me feel extremely lonely and confused.”

Purl also found herself alone at work and at home:

> I really felt alone in all of this. Alone and bewildered. There was nobody at work, nobody at home, nobody that I could talk to. There was no adult in the room that would help this 23-year-old understand what was going on.

She doesn’t reach out to her female peers outside of work about her experience, explaining, “But I don't know, the others, I don't know if…, they didn't seem to be seem to have the same experience.” When she finally goes to the doctor about her stomach problems, she realizes her doctor is the first person in her life to show any concern for her:

> I had acne on my face, and I used to pick at it so much I had these big scabs on my face from picking at the acne, you know, but nobody intervened, nobody intervened to say,

> you know what, like, are you okay? You know, everybody just kind of, I don't know, like always just pretended like it didn't exist.

Christina and Joan expressed their isolation in examples of not being heard. Joan notes, "I was frustrated and pissed off because I wasn't being heard, and I wasn't being given, or granted any value to my opinion." Christina tried to convey her experience as a mother at work to one of the vice presidents of her company, but he redirected the conversation:

> That he basically had to take everything that I talked about and turn it back into the discussion on *his* experiences and how hard *he* has worked and how I was diminishing *his* accomplishments when really I wanted to be heard about *my* experiences.

Interpretation #4: Women Engineers Cope by Using a Narrow Set of Learned Strategies.

The women describe a limited set of strategies that they had learned over time and continue to use to cope with their suffering. They maintain a high standard of performance, they are careful not to be too bold, and they "handle it."

Maintain a High Standard of Performance. The interviews reveal that women engineers protect themselves by performing to a high standard. Diane avoids her new boss' unpredictable verbal abuse, in part, by performing her job beyond reproach. She describes her hard work and extensive list of accomplishments in the first few months of her new engineering management job. She describes each one as performed with excellence and where she goes above and beyond the job requirements. "And as long as that was done, I hoped that he would stop. He would say 'oh, okay Diane is getting the team to do the work,' and then he would just kind of back off." When she realizes that her pace and high standards are unsustainable, she makes a proposal to her boss to restructure her 30-person team. Although he had initially informally agreed, her boss finally rejects her proposal, and she "started to panic."

Like Gabrielle, meeting their high standards for their work performance seem to protect them from shame. Even under unreasonable circumstances, their standards do not waver. When Purl makes a costly mistake on a task that she had no training or support for, she recalls, “I felt like a failure, and they really showed me their irritation and disappointment and I felt worse.” When Nicki starts her first student work term, she imagines and pre-empts her co-workers’ low expectations:

> I knew walking in there that it wasn't gonna be easy because I think a lot of the, like my co-workers and like managers, I think they already had a lower expectation for me. So I think I had to kind of jump the extra jump and go the extra mile to try and compensate for that.

Later, when Nicki’s performance drops from her high standard while she experiences anxiety and hypervigilance while she is sexually harassed, she blames herself for her mediocre performance review:

> Once I got the feedback I was, I was really upset about it, and I was like this is my fault, like this is all on me. I can't believe I did this. Like I suck. I'm the worst, like, all of those negative emotions.

Be Careful Not to Be Too Bold. As women engineers, hidden in their experience of suffering is the danger of not properly balancing being bold as they challenge gender norms and being careful as they navigate those same gender norms. Christina describes being angry but ignoring another co-worker after he commented about her pregnant appearance. “It felt like maybe my ignoring him was enough defiance…. I probably normally would have laughed at it, yeah. Yeah, so the rudeness from me was, yeah, defiance.” Diane wondered, “How badly do you push back, right?” as she recalls that her boss often called her and yelled at her as she was

catching the train home at the end of the day. As she normally did and despite being annoyed and angry, she responds by "placating this mad man." This time, however, she eventually hangs up on him. The next morning, she covers up her act of boldness. She reaches out to tell him they were disconnected and asked if he wanted to continue the conversation. As she rose the ranks and faced new situations, and she shifted her strategy from "just grinding and grinding and never really saying anything" to being "a role model for women who are coming up because I'm still there," her fundamental strategy remains cautious.

Nicki recalls the protective calculation she makes as she blocks her harasser from social media but not from receiving his text messages:

> Yeah, I think if I blocked him, then it would have, like, it would have raised some questions that would have kind of, they would have started the dialogue that I didn't want to have…. My manager was pretty closed-minded about a lot of that stuff, and I don't see him taking this information positively or, I don't think he would understand. I think if I blocked him, my manager would be like, why did you block so and so. He can't get ahold of you, he told me he's been trying to call you and text you for the past two days, what's going on? Those were the conversations I was avoiding and did not want to have, like, I put my own suffering, I kind of let myself suffer, in that way, to avoid other suffering.

Just as Nicki knows with her embodied reaction to an ostensibly innocent greeting, that her harasser is a threat, each participant experiences a moment of embodied knowing. In their knowing moments, one "braced herself" while others describe their "heart racing," "mind reeling," or "head spinning." Each knows they are going to pay a price for what they initially judged as safe. They had learned to be careful and were continuing to learn to be careful. Diane had to be more careful to protect herself from being fired, an experience she describes as,

“Complete anxiety - it's just you plan your life and then you have the carpet ripped out from under you. It's feeling precarious. It's feeling like fight or flight, right? It's, you're worried about your survival.” Nicki had to be more careful to protect herself from a sexual harasser. Purl found herself “Damned if you do, damned if you don't,” as she tried to find the balance. “I'll be judged either way. I'll be judged for being weak and incapable or if I take it into my hands well, then you're being aggressive.” Christina had to be more careful to protect herself from being no longer seen as “one of the boys.” She explains her dilemma:

> And then, you know, the fact that we disagreed on how much inequality had existed throughout my career. You know, I can't really get into that. I can't really get into the details like how I think things went down and you know, it just felt like I had to bite my tongue every step of the way. Because these were the things that had already gotten me into trouble.

As the women engineers balanced being bold with being careful, they made a compromise commonly made by women more broadly in society:

> Becoming willing to participate in sexist culture is a compromise, even if it is not registered as such, because we have been taught (from past experience, from what we come up against) that being unwilling to participate can be dangerous. (Ahmed, 2017, p. 36)

Handle it. Women engineers experience suffering as a need to handle it, rather than complain or be seen as the problem.

Christina regularly handles the “office creep” with humour. She explains her casual approach: “You learn very early on that you don't want to be the troublemaker, in fact, you need to be the one that can handle this.” She had learned this early in her career. As an intern, she

complained of being sexually assaulted by a co-worker at a party, only to be told that there was nothing they could do because it happened outside of work. Nicki describes her learned approach to handling homophobic remarks:

> Like the joking around, calling someone names and stuff, it's still not okay, that's still not respectful. It's still not what I deserved in a work environment. But I think because I experienced the extreme in my previous job, having even just like, any amount of discomfort was just kind of like, I can, I can handle this or not even that I can handle it, but it's kind of like I I've been through worse type of thing.

Diane learns that everyone knows about the abusive nature of her boss, so she handles it. She describes his pressure to manage her employees his way, which she resists. “No, I’m not going to do that, let me manage people my way, according to my style, but I never said that to his face, I just would ignore him…. I would just let him sort of rant at me.”

Purl is given the message at home that she is the problem, implying she needs to be the solution. “It's just, you know, you should be thankful for your lot in life. If there's a problem it’s because, you know, it's your fault.”

Interpretation #5: Women Engineers Tough it Out.

As they tough it out, the women engineers stay in control of the situation, control their emotions, and disregard the price they are paying.

Stay in Control of the Situation. As they tough it out, the women engineers stay in control of the situation and strategize how to navigate the threat in the moment.

As the situation escalates and her abusive boss fires her in full view of her co-workers, Diane stays in control. She shifts into “survival mode, like how am I going to navigate this?,” adding:

> I kind of remember saying to myself, okay he was losing it and I'm not respecting what you're doing, but I'm not gonna go to your level and start screaming back. You're in a lose-lose situation. And then I just calmly went over to a desk, and I phoned an HR manager and I said, I think Robert just fired me.

As Nicki lives with the persistent threat of her harasser, she is hypervigilant to avoid him. She describes her strategy as "avoid and be in control" and provides an example:

> I definitely had to think like four or five steps ahead to deal with this guy…. I purposely sat in the back so that I could be in control of the situation and be able to see where he's at. Make sure, like I can leave, I can be closest to the exit, that way he doesn't try to talk to me.

Control Their Emotions. As they tough it out, the women engineers control their emotions, particularly their anger.

Nicki describes suppressing her emotions while she is openly mocked as she handles a serious incident on the job:

> What I keep it inside is like the feelings of anger, I didn't, like, I raised my voice, but not as much as I would have loved to [laughter]. Like I, the anger is definitely internalized anger. I think all that anger just comes out through like my skin, turning like, like, sweating. My skin turns like beet red already, as I talk about it. My skin's literally, I could feel it's on fire. But what I'm expressing is more of like, okay, let's handle the situation. I'll deal with my emotions later. That's what I'm expressing. It's more of like a, alright, let's get this shit done, ignore my feelings for a couple hours while I fix this.

Purl internalizes her anger. "I think that's why I was holding my breath and had this bad stomach problems because all this anger was internalized." After more than a year of toughing it

out, she goes to the doctor to address her stomach problems. “When she asked me what was wrong, I just burst into tears…. She really just unlocked the floodgates.” Christina controls her anger as her male co-worker jokes about her pregnant appearance at the Christmas luncheon. “Ho ho ho,” he calls out as she passes by. She controls her anger in front of him before venting to her female colleague. “I went into Janet’s office and was like, what the fuck does that even mean?” Gabrielle describes being in the conference room when she was laid off and “trying to hold my tears but failing miserably.”

During Diane’s interview, she repeatedly avoids questions about her emotions. “I know you're trying to pull this out of me. I'm not a super, I'm not a super emotional person.” Nevertheless, numerous examples of unexpressed anger riddle her interviews and other participants’ interviews, like an undercurrent. Some expressions of anger are more overt. Diane blasts the “assholes” who have prevented her from advancing in her career and painfully concedes she has not been accepted as “one of fucking them.” Joan lashes out with words and anger she dares not express at work:

> Inside me, I'm going, what planet am I on? What, how can they possibly even think telling me that is appropriate? Like, in what kind of a world is that a reasonable thing to say to somebody? Like I just, I was like, are you fucking kidding me? Like, I just, again, frustrated, exasperated, angry.

Disregard the Price They are Paying. As they tough it out, they disregard the price they are paying, consistent with Charmaz (1999) who notes that the effects of suffering often go unnoticed until a crisis jolts sufferers into reflecting on their losses.

Although Christina asserts, “If I really ever had to, if I ever really got into a situation where things just weren't working, and I really had to scale back, then I could have that talk,” she

never does. As she “powers through” her difficult pregnancy, and suffers from anxiety and exhaustion, she doesn’t recognize their seriousness. Purl initially doesn’t notice the erosion of her spirit. “And then you get, you know, a few knocks and you go along and then then just over time it just all kind of erodes away. And then you're some former shadow of yourself at the end of it you know.”

As she relentlessly maneuvers to avoid her harasser, Nicki tolerates her loss of personal safety and makes that a priority over her declining work performance. “My work went from great, great, great, and then *plunged* down to like the bare minimum.” She also endures her deteriorating relationship with her friends and family as she isolates herself from them. Gabrielle endures a loss of her self-confidence and sense of belonging.

Interpretation #6: Women Engineers Question their Sense of Reality as they Struggle to Cope

The women engineers seem to struggle with making sense of their reality and trusting their inner knowing. While she is being fired by her abusive boss, Diane recalls questioning her sense of reality as she takes in the scene.

> It was just kind of crazy like you start questioning yourself.… I just said, okay, and your heart's beating, you know because you're, you feel like you're being attacked and you know it's unfair, but no one around is stopping it.

Early in her new job, Purl’s francophone manager asks her how to spell a word in English and then dismisses her when he doesn’t think her answer is correct. She is in disbelief but says nothing. “In the moment, I have been often stunned, bewildered, confused. I don’t respond, I don’t say anything. It’s like I retreat inside my head, in shock perhaps, while processing goes on.” She provides another example of when she offers, “I wasn’t stupid.” This statement seems to reflect her struggle to make sense of a world where everyone acts *as if* she is stupid or, at best,

“school smart” but “useless in the real world.” Christina describes the self-doubt and confusion she experienced when she raises concerns about inequity in the office only to be challenged. “These conversations are draining and they're frustrating. And I remember, you know, every time I have them, you somewhat question yourself, like am I crazy? Am I, did I make these experiences up?”

Gabrielle struggled to make sense of her experience for months after she was laid off. She describes herself as one who plays by the rules. “I do as I'm told, because I sort of follow the rules.” When she saw her job posted online only weeks after she was laid off, she made a formal complaint. She describes the mediation session with her former employer as a “David against Goliath,” where she is the weaker David fighting against the more powerful Goliath, who were “experts in reframing my story.” She recalls her uncertainty about whether she was doing the right thing, “But I was sort of torn inside. Like, am I doing a bad to them or are they doing something bad to me?” When she wins her case and a satisfactory financial settlement, she calls it a “small victory,” but struggles to identify what is small about her beating Goliath. Finally, she acknowledges that a full victory would have been “a full recognition of what I felt is wrong.” Her doubts of whether she was doing a bad remain.

Even when recalling her experiences, Joan has great difficulty finding the words to describe what happened: “Right, like I'd be like, like, what, why, like, I didn't, I didn't really say that but I was like, I didn't you know. I guess, I guess the thing is that…” Purl’s experience is so strange and “emotionally charged” that she finds it hard to find words to describe it. Nicki resisted the urge to “slap a label” on her experience, explaining, “there’s just no label to it.” Words seem to evade them as they are trying to make sense of their experiences.

Compounding their uncertainty about reality is the sense that others know and accept the injustices. Diane's boss' abusive behaviour seems to be well known and accepted. "It was so, like he, was like a spoiled brat child that was allowed to behave that way. And it's just like, wow, wow, how has this been allowed to continue?" To Nicki, it appears as if the homophobic remarks are widespread and accepted. While sitting in the cafeteria, she notices that no one seems to be bothered when a homophobic slur is thrown around.[30] "I feel like I was the only one at that table that was like, is this really happening right now? I think everybody else just kind of like, either they heard, and they just were like whatever." Christina's laughs with her male colleagues about the "office creep," confirming to her they all know and accept it. When Joan asks a question in an all-hands meeting, the president berates her in response. "We're never doing that. Why would you even think that? That's just not even like, you're completely mistaken." His public and aggressive tear-down seems to be acceptable.

Interpretation #7: Women Engineers are Trapped in an Impossible Problem to Solve.

In various ways, women in engineering described their suffering as being trapped as they tried to solve their impossible problem. Purl describes the despair and hopelessness of her situation. "[I am] standing in front of the window, feeling like a prisoner. It had got to the point really where I felt like I was just biding time between meals, until I died." Diane is looking for way out and asks herself, "How do I get out of this situation!? How can I just make it to

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[30] I faced a dilemma of whether to include the actual slur that my participant mentioned. I made my decision because I felt that the risk that the reader would be offended (if I included it) was greater than the risk that the reader would not appreciate the vulgarity of the slur (if I didn't include it).

Christmas?" She reflects on not having a guide to help her navigate her abusive boss. "Nobody sort of left a little breadcrumb for me to follow on how to deal with this guy." Gabrielle describes her helplessness with the French expression, "on perd ses moyens," which she clarifies as, "It's like, you lose what you think you have. It's like I felt helpless, helpless and without solution."

The women engineers describe a myriad of invisible forces that keep them trapped. Despite being told she should take care of herself or "Being given permission to, you know, have this baby, accept that I was pregnant," Christina struggles with the impossibility of having to continue to be "one of the boys" while enduring a difficult pregnancy. "It was exhausting. It felt like I wasn't meeting my own expectations of myself. Again, to perform and behave like I was not carrying a child."

Purl describes her prison. She is told to her face, "This is a man's place, you don't belong here" and so, after being inspired to go into engineering after the Polytechnique Massacre in Montreal where women engineers were targeted and killed, quitting represents a failure for all womankind. She endures disrespect after disrespect. She describes the erosion of her spirit and the impossibility of one of her tasks, for which she had no support nor training:

> It's just like I'm on autopilot, so then I don't say anything, I don't react, I don't debate, you know I just turn around and walk out to the control panels you know like I'm going to my firing squad sort of thing.

She clearly sees the gender discrimination but concludes, "The problem was me and I had to overcome the problem not that the environment had to change." Her confidence erodes at a time of an economic slump and, as she considers applying for other jobs, she didn't have "the courage to believe in myself that I could do the job, that I could get it, that I could do it." She has

no support at home. “My mother would tell me that I should consider myself lucky that I had a job and my father said, ‘Just because you are an engineer, doesn’t mean you know anything.’” While she can’t escape, she wonders why she is not released. “I really felt like I wasn't, I wasn't wanted, you know. Why did they keep me, why was I stuck there, in this space that was just not working for anybody?”

Nicki described the barriers that kept her trapped and silent. “I just remember thinking like, there really isn't a clear path out of this, other than to just leave.” However, she could not leave her work term early because she would lose her university credits. Compounded that she is a “people pleaser by nature,” she couldn’t confront her harasser more forcefully because, “This guy's really close with my boss, so if I piss him off, what if he tells my boss, and, like, if, there's just a power dynamic there that I don't want to mess up.” She could not complain to her manager because “I had a gut feeling that my manager would react negatively to hearing that I was a lesbian and if I told him, he would laugh or he would say it was my fault for ‘leading him on.’” Finally, she couldn’t reach out to her father who had worked there for many years and with whom she drove in to work most days:

> I think my dad would have definitely done a number on him if he found out the shit that he'd just done. And so that was another reason I wanted to keep everything quiet because I didn't want to get my dad fired.

Diane describes the impossibility of escaping her abusive boss:

> I am just trying to do my job, you know. I'm just trying to make money. I need a paycheck as I've got a family I have to feed. I had to kind of stay. I'm not financially independent, that I could just say oh, to hell with it. So I say I'm a big girl, I can take it. I'm not responsible for your behavior, right. And to push back is career suicide.

Main Interpretation: Women Engineers' Suffering in the Workplace is Lived as if Trapped in an Oppressive Lifeworld.

With their history behind them, the women engineers experience both subtle and egregious threats at work. Their past is not an individual one but is experienced as a patterned, socially constructed reality that, like Morgan's (1997) metaphor of a psychic prison, takes on an immutable quality. For the women engineers, their reality is shaped by oppressive social structures and practices (Guba and Lincoln, 1994) and by the controlling, conforming dynamics of shame (Brown, 2006; Creed et al., 2014; Scheff, 1988). Facing persistent threats, the women engineers understand that their best option is to navigate such precarious situations to protect themselves (or others) from even bigger threats, including ostracization, shame, retaliation, and job loss. Their reality is so convincing that they become trapped without being able to conceive of possible alternatives to the reality nor viable actions. Along the way, they silently sacrifice aspects of themselves, including their dignity, self-worth, health, well-being, and job effectiveness.

Discussion

The results of this study suggest that women engineers suffer as their histories collide with the hostile, gendered environments in which they work. However, their histories and the hostile environments in which they suffered are not the exception. Rather, they both reflect the sexism in society and the overwhelming evidence that suggests that the male-dominated culture of engineering systematically marginalizes women (Cardador & Barker Caza, 2018; McIlwee & Robinson, 1992; Hatmaker, 2013), including women with intersectional experiences (Cech & Waidzunas, 2011; Gibson & Espino, 2016). In addition, the persistent myth that engineering is gender neutral (Acker, 1990; Dryburgh, 1999; Jorgenson, 2002; McIlwee & Robinson, 1992;

Seron et al., 2018) likely contributes to several of my findings, including my participants' tendencies to tough it out, to blame themselves when their coping strategies fail, to stay silent, to question their sense of reality, and to feel trapped in an impossible problem. An important shift is needed from seeing women engineers who experience suffering as weak or "not able to handle it," to seeing them as immersed and trapped in a complex system of gender-exclusive norms, oppressive structures, and shame. With blame removed from the equation, my participants' experiences clearly demonstrate what was once considered a radical feminist idea, that "the personal is political" (Hanisch, 1969). In other words, they demonstrate that women engineers' personal experience of suffering in the workplace is enmeshed with women's inequality.

The results also add clarity to the image of the mysterious leaky pipeline. Rather than travelling through the pipe smoothly and exiting as a gentle trickle, women can now be seen as getting caught in the sludge built up in the pipe that few care to look at. They eventually get unstuck and, stained by the crud they have been through, either continue along the pipe or make their way out. With this new image, it is clear to see that any efforts to improve the flow along the pipe must acknowledge and address the sludge. In other words, to achieve gender parity in engineering, interventions must acknowledge and address engineering's hostile environment.

Critique of the Dominant Change Strategy

Despite much research and interventions aimed at attracting and retaining women in engineering, progress has been lackluster since a surge in the 1970s and 1980s (McIlwee & Robinson, 1992; Statistics Canada, 2016). Adams' (2019) research on women engineers in Ontario found that conditions are not necessarily improving despite many initiatives; hostile environments persist. This study suggests that progress based on interventions that do not acknowledge covert dynamics, such as the ones women in this study spotlight, will continue to

be slow (Marshak, 2006). Presumably, all engineers are immersed in these same dynamics, whether they are aware of them or not, whether they are inconspicuous or blatant, or whether they experience them as painfully as the research participants or not. Like Kendi (2019) found with racism, unless one consciously works against them, they are also contributing to these same dynamics, including, as Seron et al. (2018) have shown, women in engineering.

An example of such superficial interventions is reflected in the dominant narrative in engineering. From this researcher's observations, including regular reading of Engineers Canada's daily media report, review of academic and industry reports, and attending women in engineering events, the dominant change effort appears to be to celebrate the contributions of women in engineering, encourage science and mathematics education for young women, and promote how welcoming the profession is to women. However well-intentioned, this dominant conversation that engineering is open and welcoming to women, may be part of the problem. Without balancing such initiatives with honest conversations about the erosion of women's confidence to fit into the culture of engineering during university (Seron et al., 2016) and their subsequent marginalization that continues in the profession (Adams, 2019; Beddoes, 2021; Ordres des ingénieurs du Quebec, 2022), women may remain silent about their experiences and blame themselves. While energy is focused on self-blame, women engineers may fail to recognize systemic issues, be silenced by shame, and unintentionally contribute to maintaining the status quo. If, for every article highlighting a woman engineer's success, we saw headlines, such as:

1. "Women experience hostile engineering work environment;"
2. "Psychological abuse, sexualization and belittling continues to be experienced by women in engineering;"

3. “Women engineers’ performance drops due to undiscussable systemic marginalization;”
4. “Another woman’s disturbing story of why she left engineering;” or
5. “Another woman quietly leaves engineering while thinking she’s the problem.”

what shift might take place?

Systemic Change Strategies

In addition to interventions that target pipeline issues (e.g., encouraging women into engineering) and retention issues (e.g., mentoring), this study calls for *all* engineers to recognize and understand these gender-exclusive dynamics, their role in maintaining them, and the harm such dynamics can cause as important components of achieving the profession’s goal of gender parity. Here, rather than suggest “band-aid” strategies that might target my findings directly but continue to maintain the status quo, such as encourage women to talk about their experiences where it is safe to do so, I suggest systemic changes.

Updating Engineering Education and Rituals. Engineering education and rituals need to acknowledge and address equity and inclusion. While there have been some calls for a focus on social justice in engineering education, these calls generally refer to ethical engineering practice, impact on communities, and responsibility to the environment (Badenhorst et al., 2020). While these aspects of social justice are important, this study also calls for a focus on inclusive (anti-sexist, anti-racist, etc.) education for all engineers. As long as belonging in engineering means to be considered “one of the boys” or, as one participant once believed, that there is no difference to being a woman or a man in engineering, these dynamics will be reproduced. As Acker (1990) found in organizations in general, not “seeing” gender in engineering organizations ignores gender dynamics and structures that advantage men and denies the reality of women.

In addition, the 100-year-old iron ring ceremony is a meaningful ritual to engineers that should be updated. Its goal is to bond new engineering graduates and "foster ethical conduct as a lifelong obligation for engineers educated in Canada" (Corporation of the Seven Wardens, 2020, "Vision Statement"). The ring conferred at this ceremony is intended to be worn as a reminder to engineers of their ethical responsibility to society. This study calls for the iron ring ceremony and the engineer's ethical responsibility to *explicitly* expand its original scope and include social justice in engineering, not just as evidenced by their work products but by the inclusive way they collaborate within the profession.

Women Engineers and Feminism. Engineering should embrace intersectional feminism (Ahmed, 2017). Seron et al. (2018) found that many women engineers embrace engineering's ideology of meritocracy and distance themselves from (or even reject) feminism because they believe that feminism is about giving women an advantage and "a voice of complaint" (p. 3). Instead of embracing feminism, women engineers acknowledge their gender-based, challenging experiences, but they tend to frame them as individual or isolated incidents rather than part of a larger system of marginalization and oppression. As Ahmed (2017) points out, this mindset is a mechanism that keeps sexism in place. When women complain, they are construed as the problem and so the blame and invisibility of systemic oppressive forces persist. In addition, engineering has a strong sense of belonging and women threaten their belonging when they complain (Dryburgh, 1999). Women engineers' rejection of feminism appears contradictory or paradoxical, given their relative success in a man's world. However, this is precisely the problem: that engineering is a man's world, where women are generally not expected to be. This study clearly demonstrates that it is time for all women engineers to understand and embrace intersectional feminism, which includes women whose identities intersect with other forms of

marginalization. This proposal is not new. In their comprehensive study of women in engineering 30 years ago, McIlwee and Robinson (1992) proposed a wide range of interventions to increase the participation of women in engineering, including improving the early experiences of young women so that they are prepared to study engineering, improving both the perception and the reality that the profession is a good one for women, and reimagining family roles so that they are more compatible with career success of women. These recommendations have largely been implemented. However, their boldest suggestion - for an organized, revitalized feminist movement that shifts power relations - seems to not have been adopted despite their warning that sustained change was unlikely without it. This lack of enthusiasm for feminism is not uncommon and points to the importance of this study, and where "so much feminist and anti-racist work is the work of trying to convince others that sexism and racism have not ended" (Ahmed, 2017, p. 6).

To Women Engineers who are Suffering

As I close this paper, I would like to speak directly to women engineers who may be suffering in the workplace. I'd like you to know that you are not alone. You are not the problem. You are not irrational. Much of your suffering is likely due to systemic inequality in engineering. It's not right that you have to cope by holding yourself to such a high standard, by being careful not to be too bold, or by having to "handle it" without complaint. You have the right to be comfortable at work and you should not have to "tough it out." It should not be a privilege to direct your energy into your work rather than into controlling the situation and your emotions. Notice the price you are paying. You are not trapped – you have choices. Acknowledge your worth, trust yourself, and prioritize your health and your spirit.

CHAPTER 5: DISCUSSION

In this thesis, I have described the rationale for this study, the context in which it is set, the methodology, and the findings. Here, in the discussion, I will look back on the study and speak of its significance and contribution to the problem of attracting and retaining women in engineering. First, I will demonstrate the alignment of my findings to the existing literature regarding women in engineering and microaggressions. As you will see, for most of my findings, they align quite well. In other words, other scholars have found similar findings. However, as I will explain, it is in the intersection of these two scholarly areas, women in engineering and microaggressions, that my findings reveal something new and generate further insights and questions about why the field of engineering is so persistently male-dominated. At this nexus, the new insights suggest areas for future research and support recommendations for change to engineering professional bodies and industry. An overview of the entire research process, including the culmination of it in this discussion, is provided in Appendix C.

It is important to note that the literature reviews on women in engineering and microaggressions that are provided in Chapter 1 were conducted after the completion of the data collection and data analysis. This is an important feature of reflective lifeworld research (Dalhberg et al., 2008), where researchers are encouraged to do only a partial review of the theory before conducting the research so that they remain open to the phenomenon. Before I conducted the research, instead of focusing my literature review on the engineering culture and women engineers' experience of it, as I have done in Chapter 1, I focused only on establishing why women engineers' suffering in the workplace was a worthwhile topic of research. This included quantitative data describing trends in participation and retention as well as broad issues facing women in engineering. Only once the research findings were established did I conduct the

extensive literature reviews on women in engineering and microaggressions presented in Chapter 1.

Review of Findings Against Existing Literature

Many of my findings are supported by existing literature. Here, I review each finding and discuss its alignment with existing research on women in engineering, microaggressions, and other relevant scholarship related to gender and work. While I review each finding separately, I do not wish to give the impression that the findings can individually stand separate and alone. It is in stepping back and looking at this analysis as a whole where new insights and questions are revealed, which I will do following this initial part of the discussion.

Interpretation #1: They Experience the Engineering Workplace as a Threatening Context where it is not "Normal" for Women to be Engineers

Women in Engineering

This finding is strongly supported by the existing literature on the engineering culture, as reviewed in Chapter 1. Forty years of research on the engineering culture has consistently found that it is a masculine culture (Dryburgh, 1999; Evetts, 1998; Faulkner, 2009a; Hacker, 1981; Khilji & Pumroy, 2019; McIlwee & Robinson, 1992; Male et al. (2018); Seron et al., 2016; Tonso, 2007). Tonso (2007) sums up her findings on one engineering campus, "The prevailing system took men's perspectives for granted, denied that women's perspectives are (or could be) different, and *systematically* failed to 'see' women." (p. 246). Others have gone beyond gender and found that the engineering culture included homophobic jokes (Faulkner, 2006), placed additional burdens on LGB-identifying student engineers (Cech & Waidzunas, 2011) and Black engineers (Gibson & Espino, 2016) to fit in. Beddoes (2021) and Weidler-Lewis (2020) found more generally that the engineering culture privileges the dominant group.

In addition to those who expressly studied the engineering culture, others found engineering's masculine culture implicit in their participants' responses to it. For example, several found that women adopt more masculine identities (Gill et al., 2008) and work hard to be "one of the boys" (Powell et al., 2009; Ranson, 2005). Related, Hatmaker (2013) found that women engineers downplayed aspects of their femininity. Going further to investigate other intersecting identities, Cech and Waidzumas (2011) found that LGB-identifying students downplayed their LGB identity while Gibson and Espino (2016) found that Black women made meaning of their experiences in engineering as they encountered stereotypes and assumptions about Black women and Black people in general.

Together, the existing literature supports the finding that it is not "normal" to be a woman in engineering, with additional burdens for those with intersecting identities.[31] Further evidence supports the threatening aspect of this context and the risk of retaliation for not tolerating the masculine culture. Faulkner (2009a) and Powell et al. (2009) found that to complain about gender discrimination risks retaliation, including ostracization. More generally, Gill et al. (2008) found that women engineers' experiences of coping with marginalization left them "battle weary" (p. 231) and "emotionally exhausted" (p. 232).

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[31] Exceptionally, Alfrey and Twine (2017) found that "racially dominant (white and Asian) women, who identified as LGBTQ and presented as gender-fluid, reported a greater sense of belonging in their workplace" (p. 28), suggesting the most important thing is to be most like the dominant culture.

Microaggressions

Microaggressions also take place in a social context that is threatening and where the implicit norms of the dominant group "justify" them (Huber & Solarzano, 2015). As mentioned earlier, microaggressions are external representations of a dominant group's tacit beliefs about who is superior or "normal" (Sue, 2003, as cited in Sue, 2010b). When one is not considered "normal," one experiences everyday microaggressions that can seem innocuous but their accumulated "bombardment" (Sue et al., 2019, p. 129) is described by many as very painful.

Some studies have focused on microaggressions in engineering education context. In Diaz-Espinoza's (2015) study of gendered microaggressions experienced by women engineering undergraduate students, she found that some students expect to experience microaggressions "by nature of being in the engineering environment" (p. 123). She also found that her participants were particularly susceptible to indirect microaggressions or witnessing the microaggressions of other women engineering students. For example, if one woman engineering student's question was mocked, others would take note and defend against experiencing such a microaggression in the future. True-Funk et al. (2021) found that engineering students with intersectional experiences experienced microaggressions that contributed to a feeling of "otherness" in relation to the dominant culture.

Interpretation #2: They Focus on Coping with the Threats in the Present Moment while not Noticing their Evolving Suffering

Women in Engineering

My research found that women engineers who experience suffering in the workplace are so focused on their survival in the present moment that do not notice their evolving suffering. As an evolving process, I found that their suffering begins with an awareness of threat, continues as

they endure and resist it, peaks and subsides as they exit the context, and it finally leaves a lasting impact. Although there is widespread acknowledgement that the context makes it more difficult for women in engineering than their male counterparts (Cardador & Barker Caza, 2018; Dryburgh, 1999; Faulkner, 2009a; Hatmaker, 2013; McIlwee & Robinson, 1992), I found no research on the process women engineers experience over time as they cope with their threatening context. However, Hatmaker (2013) tentatively suggests "it is likely that this extra work places a strain on women engineers that simply is not felt by men" (p. 394). Cardador and Barker Caza (2018) draw the conclusion from several of their studies that women engineers experience subtle stress from working in a male-dominated field and that the accumulation of stress contributes to their leaving the profession. However, these studies do little to illuminate the process. In addition, their gentle use of language (e.g., "strain" and "subtle stress") seem to downplay the potentially debilitating effects.

Microaggressions

The research on microaggressions provides some similarities with my findings. As I will discuss later, I found no research on when microaggressions start. However, like I found for women engineers' experience of suffering in the workplace, people who experience microaggressions focus on coping with them in the present moment while they are tolerated over time and leave a lasting impact.

Microaggressions are coped with in the present moment. As Sue et al. (2007) found, people who are the targets of microaggressions are faced with a dilemma that they must deal with in the immediate. Because microaggressions are most often subtle and ambiguous in nature, they tend to happen fast. If not addressed in the moment, the opportunity may be lost. In that moment, targets of microaggressions must process what just happened and respond in what is

often a no-win scenario. If they respond outwardly and object to the microaggression, the perpetrators often subject the target to a painful, secondary microinvalidation by denying their underlying bias. If they stay quiet about the microaggression, they often feel hurtfully devalued and disrespected. Each "cut" represents this difficult dilemma in the moment.

Microaggressions are also endured and resisted over time. Since microaggressions are everyday occurrences that manifest in social contexts, marginalized people cope with them on a regular basis (Sue et al., 2007). In addition, whether one fights them or remains silent, both responses, as mentioned above, typically do little to change the status quo. With each microaggression, an assessment is made whether confronting the perpetrator is "worth it" (Nadal, 2018, p. 97). The microaggressions are endured.

Microaggressions take their toll and can leave lasting impacts. Over time, targets of microaggressions experience microaggressive stress (Sue, 2010b). It has been found that they can eventually develop low self-esteem, illness, and depression as they adopt defensive behaviours and expend effort coping with the microaggressions. Nadal (2018) agrees and further argues that microaggressions can lead to *microaggressive trauma* for people. Microaggressive trauma is the tireless exposure to subtle, individual, and societal discrimination (microaggressions) and their persistent and lasting impacts. Again, although individual microaggressions do not always or necessarily cut deeply, "they can certainly be pervasive and compromise one's sense of psychological safety, resulting in typical symptoms associated with trauma" (p. 13).

As I have shown, there is little research on the process women engineers go through as they cope with their threatening context. However, there are striking similarities between the

process of women engineers' suffering in the workplace over time and how the experience of microaggressions evolves over time.

Interpretation #3: They Struggle Privately and Alone

Women in Engineering

My research found that my participants struggled privately and alone. In the literature on women in engineering, I found little that addresses women engineers' sharing their struggle. On the surface, Khilji and Pumroy's (2019) findings suggest women engineers lean on each other for support through mentoring and professional networks. However, they frame this support in the context of reinforcing their "tough skin" (p. 1043), where women engineers need to "band together to create strong social capital" (p. 1043). Others have found that women engineers cope with the male-dominated context by distancing themselves from women who don't conform or who complain about their marginalization (Powell et al., 2009; Ranson, 2005; Rhoton, 2011). Both of these findings suggest that to speak about issues of marginalization, even among other women engineers, is risky and vulnerable, which is consistent with my findings.

Microaggressions

I found no research that directly addresses whether targets of microaggressions struggle privately or alone. However, Nadal et al. (2013) found that women have a range of emotional reactions to microaggressions and that many internalize humiliation, guilt, anger, and discomfort. These verbal descriptions of experience may all be expressions of shame (Retzinger, 1995). In addition, it seems highly likely that microaggressions trigger shame, given what Retzinger (1995) describes as provoking shame:

> Stimulus situations that evoke shame may be either overt or covert, real or imagined. They include messages perceived as disparity in a relational experience: self is the object

> of disappointment, defeat, rejection or fear of rejection, betrayal, judgmental comparison, loss of face, exposure, rebuff, inattentiveness, unrequited love, disappointment, failure, disrespect, or ridicule. (pp. 1005-1106).

If microaggressions trigger shame, then it becomes clear why one may struggle privately and alone. Specifically, people tend to not talk about their experience of shame because of their fear of judgment (Lewis, 1971). Simply put, shame triggers more shame.

Interpretation #4: They Cope by Using a Narrow Set of Learned Strategies

Women in Engineering

The next finding that is supported by the existing literature is that women engineers *cope by using a narrow set of learned strategies, including a high standard of performance, being careful not to be too bold, and handling it.* Here again, existing literature aligns with this finding. Before delving into the specific strategies found in my study, I will first discuss what we know about the learning that takes place, which includes learning through professionalization, enculturation, and socialization.

Dryburgh (1999) and Tonso (2007) found that women engineers learn to be part of the culture of engineering through a process of professionalization and enculturation while in university. While this learning process applies to both men and women (and for professions in general), Dryburgh (1999) found that women tend to work harder than their male counterparts to adapt to the culture of engineering. As they enter the profession, further socialization takes place. Beddoes (2021) proposes a model of engineering organizational socialization in which learning and adapting form a major element of moving from an outsider who is unfamiliar with the organizational culture to an insider who navigates the culture with ease. In her study of early

career engineers, she found that women, including those with intersecting identities, learn to adapt in an environment where certain privileges are not afforded to them.

Other findings imply that girls often learn by omission that engineering is not for them. McIlwee and Robinson (1992) found that women's early, feminine socialization disadvantages them in engineering. The tangible disadvantages point to a deeper socialization where girls get subtle messages discouraging them from engineering. Combined with the widespread image of engineering as masculine (Faulkner, 2000a, 2006; McIlwee & Robinson, 1992; Phipps, 2002), they also imply that girls learn by omission that engineering is not for them.

From a broader perspective, Martin (2003) conceptualizes gender as a learned, social construct where meanings, behaviours, and expectations are associated with gender. My point here is to emphasize that women are socialized throughout their lives to tacitly practice gender and women in engineering bring this learning with them as they enter university and join the profession. As Faulkner (2009a) found, doing engineering involves "doing gender" (p. 3) or "performing certain masculinities" (p. 4) and, like all women, women engineers are well practiced.

In my study, I found three learned strategies for coping with the context that are also supported by the existing literature on women in engineering: maintaining a high standard of performance, being careful not to be too bold, and handling it.

Maintaining a High Standard of Performance. I found that one way that women cope in the masculine engineering environment is to maintain a high standard of performance. This finding is well supported by the existing literature. Many scholars have found that engineers who are women or members of non-dominant groups cope by "proving" themselves (Hatmaker, 2013;

Gibson & Espino, 2016; Powell et al., 2009) or by working extra hard (Evetts, 1998; Cech & Waidzunas, 2011).

This finding also aligns more generally with Kanter's (1977) study on women who are *tokens* in a male-dominated workplace, as most women engineers are. In groups where with a large majority, tokens represent the minority of group members or less than 15%. Kanter (1977) found that women are highly "visible" as tokens and therefore feel pressure to perform well and represent *all* women. While their mistakes are highly visible, paradoxically, their accomplishments are overshadowed by their token status and are often not recognized. As a result, one way that women cope with this pressure is to work extra hard.

Be Careful not to be Too Bold. In my study, I found that women engineers are careful not be to too bold and cited Ahmed's (2017) assertion that women compromise in a sexist environment because of the inherent danger of going against the grain. I found several examples of this finding in the existing literature. Generally, and as already discussed, one way that women are careful not to be too bold is with respect to the masculine culture of engineering, where they adopt a more masculine identity and downplay aspects of their own identities. Several more examples were also found.

Hatmaker (2013) found that one way that women engineers cope with a particular form of marginalization is by interrupting/rationalizing. Specifically, when gender expectations were imposed on them (e.g., they were expected to take the notes for the group), they responded by either bluntly interrupting and challenging the expectation or by acquiescing and rationalizing their inaction. These contrasting responses imply women are faced with a dilemma when gender expectations are imposed on them where they may have to be careful not to be too bold.

Others found evidence that suggest women were cautious as they navigated the culture. Dryburgh (1999) found that women work hard to convey that they are "one of them" and are not a threat to the culture. Gibson and Espino (2016) found that Black women engineers were cautious in their interactions with peers to assuage the other's discomfort. As mentioned earlier, several researchers have found that women face the threat of retaliation for not tolerating the masculine culture (Faulkner, 2009a; Gill et al., 2008; Powell et al., 2009) or for being too bold.

Kanter's (1977) work on tokenism is also a useful lens here. While token women's visibility puts pressure on them to work extra hard and overperform, it also presents a dilemma. Because of their heightened visibility, token women risk retaliation for outperforming the dominant group, i.e., men. As a result, Kanter (1977) found that some women choose to keep a low profile and avoid conflict. As my study found, women are careful not to be too bold.

Handle It. Another strategy that women had learned to cope with the context was to handle it, and not complain. In many ways, all coping mechanisms described in the existing literature can be thought of as handling it as an alternative to complaint. However, I'd like to highlight some specific examples that closely related to my findings, where women simply "handle it." Powell et al. (2009) found that women engineering students join in the joking and "give as good as [they] get" (p. 418). Evetts (1998) also found that one way that women engineers deal with marginalization in the workplace is to play along and throw jokes and inappropriate comments back at the men.

Microaggressions

People who experience microaggressions also develop coping strategies. As discussed already, Nadal et al. (2013) found that women develop behaviours to cope with gendered microaggressions. As with my finding of *maintaining a high standard of performance*, they

found that women work harder to prove themselves and dispel negative stereotypes. They also found coping strategies related to my finding of *be careful not to be too bold.* They found that women are faced with microaggressions that directly challenge women's boldness (Lewis & Neville, 2015; Yang & Carroll, 2018). In addition, the dilemma they face in the moment that I have described can be characterized as being careful not to be too bold. Finally, with respect to my finding of *handle it*, it seems reasonable to infer that with each microaggression, there is an implicit requirement that they handle it in the moment. However, my finding of "handle it" also implies to do so without complaint. It is also plausible that women do not complain about microaggressions for fear of not being believed or invalidated.

Interpretation #5: They Tough it Out

Women in Engineering

My finding, that women engineers *tough it out*, is supported by the existing literature. Dryburgh (1999) found that engineering education has a "work hard" culture where students are weeded out in the first year. Those who make it are "united in hardship" (p. 671). I suspect that, for women, toughing it out extends from the academics to the culture where she also found that women engineering students tend to accept and not criticize the masculine culture, a finding consistent with Powell et al.'s (2009) work. Evetts (1998) also found that some women respond to the masculine environment by tolerating and submitting to the gendered culture. Said differently, Khilji and Pumroy (2019) found that women engineers develop a "tough skin" (p. 1043). In the harsh offsite environment of an oil rig, Faulkner (2009a) found that most de-sensitize themselves or otherwise "find ways to live with the culture" (p. 11). Further examples that align with my findings are presented below as I discuss how my participants toughed it out.

Stay in Control of the Situation. Although there is some existing literature that supports this finding, the link is relatively weak in comparison to other findings. In one example from the literature, Dryburgh (1999) found that women engineering students use impression management to influence others' perceptions of them in a favorable way, a strategy that arguably involves being vigilant in controlling the threatening situation. Specifically, she found that women engineering students project confidence in their engineering abilities despite experiencing self-doubt and anxiety. Hatmaker (2013) also found that women engineers take steps to intentionally project an image of competence (e.g., introduce themselves with their credentials).

Stay in Control of their Emotions. Few studies mention the emotions experienced by women engineers, let alone their control. However, engineering has a strong image of detached rationality that is associated with masculinity. Hacker's (1981) early study of the engineering culture found that displaying emotions is seen as feminine and inferior to the masculine rationality of engineers. The cultural belief of engineers about gender and rationality (or femininity and irrationality) also corresponds with notions in broader society (Sweet, 2019). Dryburgh's (1999) study exceptionally links to emotion. She found that women engineering students project confidence as a way of handling the "double anxiety" (p. 673) of the demands of their engineering work and of the masculine culture. Tangentially, Powell et al. (2009) found that women engineers tend to distance themselves from women engineers who showed feminine traits, including crying, implying that emotions are to be controlled or overcome. Overall, evidence is consistent with women engineers controlling their emotions.

Disregard the Price They are Paying. Existing literature provides some support for my finding that women engineers *disregard the price they are paying*, as they cope with their context. Paying a price appears to be "normal" for women engineers. For example, Khilji and

Pumroy (2019) found that women engineers tend to experience non-linear career paths and, as a result, they downgrade their expectations and change their priorities, perhaps implying that they concede the price. They also found that women engineers make "tough life and career choices" (p. 1042) but, in their interpretation, they are silent on whether these choices are actually framed by the participants as "tough" and a high price or rationalized as pragmatic. In addition, Ranson (2005) found that, with motherhood, some women engineers re-evaluate and down-shift their career while denying the change was related to the difficulty in sustaining their protective, masculine self-image while a mother. Finally, Powell et al., (2009) found that women engineers think the advantages of the profession outweigh the disadvantages, also implying that is normal to pay a price.

Microaggressions

Given the often no-win nature of microaggressions, targets often tough them out. Their coping strategies imply they control the situation and control their emotions. In addition, they usually pay a price with each microaggression they experience. The price paid for each microaggression, which might seem minor, accumulates over time (Sue et al., 2007). Targets of persistent and repeated microaggressions have been found to experience psychological distress, depression, and even trauma symptoms (Nadal, 2018).

Interpretation #6: – They Question their Sense of Reality

Women in Engineering

With the exception of research on microaggressions in engineering, I found no research to suggest that women in engineering experience questioning their own sense of reality. Ironically, and as will be discussed later, Rhoton's (2011) research found that women in engineering question the reality of other women engineers. She found that some women in

STEM fields distance themselves from women in STEM who point out or complain about gender discrimination. They attribute other women's claims of gender discrimination to their imagination, suggesting they are "looking for it" or paranoid.

Microaggressions

As previously described, microaggressions are often subtle and unconscious manifestations of stereotypes and prejudices (Sue et al., 2007). Microaggressions are also often ambiguous and the targets of microaggressions often question if their perceptions of them are correct. In addition, if they choose to raise their concern to the perpetrator, the perpetrator often denies any underlying prejudice or ill intent. This invalidation is experienced as a second microaggression. The target can be left confused and invalidated.

Interpretation #7: They are Trapped in an impossible Problem to Solve

Women in Engineering

In my study, the women engineers found themselves trapped in impossible problems to solve that were unique to them and their context. In the existing literature, the impossible problems women engineers find themselves in are more generalized and suggest an environment with limited freedoms relative to their male colleagues. For example, and similar to Tonso (2007), Faulkner (2011) found that women engineers find themselves in a paradox where they can neither be fully women nor fully engineers. Her finding aligns with what is inferred by the actions of women who downplay their femininity and intersecting identities (Cech & Waidzunas, 2011; Gibson & Espino, 2016). Finally, several studies found that women engineers found it difficult to simultaneously be fully mothers and engineers (Jorgenson, 2008; Khilji & Pumroy, 2019; Ranson, 2005). Women engineers seem to face impossible dilemmas that their male counterparts have the privilege not to.

Microaggressions

As mentioned earlier, people who experience microaggressions are often faced with a no-win situation. If they remain silent, they risk painful, internalized feelings. If they speak out and confront their perpetrator, they risk denial and a secondary microinvalidation (Sue et al., 2007). As Nadal et al. (2013) found, even direct, assertive responses often don't necessarily make a difference. Sue et al.'s (2019) review on disarming microaggressions found no easy answer. Responding effectively requires the target to be quick on their feet to recognize the microaggression and determine the best strategy to respond to and educate the perpetrator, in what they refer to as "not only a science but also an art" (p. 134). Without awareness and skill, microaggressions can be seemingly impossible problems to solve.

Summary of Review

Based on the discussion so far, we see that there are several findings that align well and some do not. As I will demonstrate in the next section, this alignment (and misalignment) of my results with the literature forms the basis of extending my discussion and generating new insights into the problem of attracting and retaining women in engineering. To summarize, as shown in Table 3, with respect to women in engineering, several my findings are consistent with the existing literature on women in engineering while others are not consistent or are consistent, but with a weak link. With respect to microaggressions, all my findings are consistent with the existing research on microaggressions, with two caveats (one was consistent with one exception and the other was consistent but indirectly if using the lens of shame). One important finding from the existing literature on women in engineering that is not included in the table merits highlighting here. The denial of sexism in engineering did not surface as a finding in my research, possibly because my participants had experienced a crisis which raised their awareness

of sexism (Downing & Roush, 1985). I draw attention to it here because it will be relevant as I broaden the discussion.

Table 3

Comparison of This Study's Findings to Existing Literature

This Study's Findings	Women in Engineering	Microaggressions
#1. They experience the engineering workplace as a threatening context where it is not "normal" to be a woman;	Consistent	Consistent
#2. They focus on coping with the threats in the present moment while not noticing their evolving suffering;	Not found	Consistent, but with no mention of when microaggressions start
#3. They struggle privately and alone;	Not found	Consistent, but indirectly
#4. They cope by using a narrow set of learned strategies	Consistent	Consistent
#4. Maintaining a high standard of performance	Consistent	Consistent
#4. Being careful not to be too bold	Consistent	Consistent
#4. Handling it	Consistent	Consistent
#5. They tough it out	Consistent	Consistent
#5. By staying in control of the situation	Consistent (but weak)	Consistent
#5. By controlling their emotions	Consistent	Consistent
#5. By disregarding the price they are paying	Consistent	Consistent
#6. They question their sense of reality as they struggle to cope; and	Not found	Consistent
#7. They are trapped in an impossible problem to solve.	Consistent (but weak)	Consistent

Broadening the Discussion

In this research, six women engineers shared their diverse experiences of suffering in the engineering workplace. They shared their experiences of severe and protracted distress (their "death by a thousand cuts") as they simply did the work they loved and were trained to do in an

environment where it was not “normal” for them to be engineers. Initially, some didn’t necessarily notice the threatening nature of the environment because it was so natural for them. They worked hard. They downplayed aspects of themselves to fit in. They pre-empted others’ underestimation of them. They controlled their emotions - especially their anger. They learned not to complain. They toughed it out. Over time, the threat became increasing difficult to tolerate and took its toll. They felt trapped and kept silent. In the safety of the research context and with their suffering largely behind them, they shared their intimate experiences that they dared not voice at the time.

The existing literature on women in engineering provides supporting evidence for many of the findings of this study, suggesting that women engineers’ experience of suffering in the workplace manifest in the everyday experience of women in engineering. In other words, their everyday context, their coping strategies, and their tendency to tough it out are well-known and common aspects of women engineers’ everyday experiences. Importantly, none of the supporting evidence provided in the previous section resulted from an investigation of women engineers’ experience of suffering in the workplace. The results summarized previously simply came from the study of women engineers’ experience of their context. So, if the everyday coping and toughing out of the context was nothing particularly special or uncommon for the participants in my study, what does that say? It might be tempting to say that the women who experienced suffering were somehow flawed and to blame for not being cut out for engineering or not being tough enough. It might also be tempting to say that there are a few “bad apple” men who spoiled it for my participants. In this section, I will take a step back, look at the findings as a whole and discuss what *provocative* insights this research brings to the study of women in engineering if we shift from blame to a systemic lens.

Provocative Insights

Provocative is defined as "causing anger or another strong reaction, especially deliberately" (Oxford, n.d.). I call the following insights provocative because, as a woman who has experienced suffering in the engineering workplace, I feel a sense of anxiety as I state them. It is the same anxiety I felt when I first wrote that it is not "normal" to be a woman in engineering. It involves the fear of stepping on the same metaphorical landmine that I described in my autoethnography in Chapter 3. It involves my learned fear of provoking a strong reaction when my expressions are invalidated and reflects what I have learned about what is legitimate to speak openly about (Marshak, 2006) in engineering. By labeling my insights as "provocative," I acknowledge the resistance they may generate and give myself permission to express them anyway.

Provocative Insight #1

The engineering profession is rife with microaggressions against women and has unique macroaggressions that exacerbate women's experiences. The existing literature and the new findings suggest that the everyday experiences of women engineers are rife with microaggressions nested within dominant ideological beliefs or macroaggressions. Macroaggressions signal what is "normal" in a given context and "justify" microaggressions (Huber & Solarzano, 2015). Further, what is considered normal is often hidden in plain view, which gives microaggressions much of their invisibility (Nadal, 2018) and resilience.

Women engineers experience microaggressions within society *and* specific to engineering. As in broader society, women engineers experience microaggressions at work based on their gender and intersectional identities. Microaggressions manifest within a context of oppressive macroaggressions in society at large. For example, women of all professions are often

assumed to be less capable than men (Capoldilupo et al., 2010; Nadal, 2010). However, in engineering, this assumption is compounded by other macroaggressions that are specific to the profession. From my research findings and analysis, I propose that the macroaggressions that exist include that technology is masculine, that engineers are tinkerers, and that engineers are detached and rational, among possible others.

Technology is Masculine. The macroaggression that technology is masculine is deeply embedded within the history of engineering. Although women today are overtly accepted in the profession and overt microassaults do not take place as frequently as in the past (Sue, 2010a), the profound association between technology and manliness manifests in microaggressions. It may involve assumptions that women who appear more feminine are less technically oriented than the stereotypical engineer. It can manifest in a variety of microaggressions perpetrated against women in engineering, including ignoring their questions, not valuing their opinions on technical matters, or assuming they are a better fit for less technical, "pink-collar" jobs in engineering (McIlwee & Robinson, 1992). In my study, evidence of such hidden microaggressions is found, for example, in Gabrielle and Christina's ease with fitting in as "one of the boys."

Real Engineers are Tinkerers. There is also widespread belief that "real" engineers are naturally keen tinkerers. This may stem from the time before engineering was established as a profession. At the time, engineering included hands on work and traditional engineering disciplines that were more concrete in nature (e.g., mechanical and civil engineering). Today, technicians, who were excluded from engineering when it was established as a profession, do the bulk of the hands-on work. In addition, with advances in technology, modern engineering has become more complex and new disciplines have emerged that are more conceptual in nature (e.g., biosystems and software engineering). Over time, engineering has evolved to where hands-

on tinkering is no longer a vital or even necessary skill for many engineers. Where it is vital, surely if surgeons can learn to do their work without any prior "tinkering," then so can engineers! Today, because the socialization of girls restricts their access to tinkering with machines, this stereotype of engineers manifests in microaggressions, and needs to be challenged. In my study, evidence of such hidden microaggressions is found, for example, in Nicki's anticipation that she will be underestimated in her new manufacturing job.

Engineers' Masculine Rationality is Superior. Another example of a macroaggression in engineering is the belief that engineers' masculine rationality is superior to feminine irrationality (Hacker, 1981). Left unchallenged, both men and women engineers may agree that it's normal for an engineer to be rational and they may not notice the microaggressions that this macroaggression "justifies." For example, they may not notice that their non-verbal disapproval of a woman's display of emotion is a microaggression. The target of the microaggression may also not register it as such due to internalized acceptance of such ideology. Further, women engineers may likely not notice their own distancing from other women engineers who are emotional as a microaggression. In my study, evidence of such hidden microaggressions is found, for example, in my participants commitment to controlling their emotions.

Implications for Future Research

As reviewed in Chapter 1, there is very little research on microaggressions and macroaggressions in engineering. What little there is on microaggressions tends to focus on STEM and engineering students, which remains important, but more research is also needed on women engineers who are practicing in the field and those who left. This is especially important because women tend to fare better in university than when at work (McIlwee & Robinson, 1992). My literature and research findings surface the following questions for further research:

- In education and in the profession, to what extent do women in engineering, including women with intersectional experiences, experience microaggressions?
- What microaggressions are unique to the engineering profession?
- In what unique ways do women engineers cope with microaggressions?
- What is the impact of microaggressions on women's attraction to and retention in engineering?

Since macroaggressions are ideological beliefs that "justify" microaggressions, it is equally as important to research engineering macroaggressions. My literature and research findings surface the following questions for further research:

- What macroaggressions exist in engineering?
- How are macroaggressions in engineering sustained in education and in the profession?
- In what ways do engineering macroaggressions manifest in microaggressions?

Provocative Insight #2

It is likely that all women engineers experience the strain of microaggressions in the workplace and have the potential to suffer from them. As mentioned earlier, I found no mention of when microaggressions start. In reviewing the literature, it is as if microaggressions have always just been there.[32] In the case of women in engineering, there is little doubt that they have been exposed to microaggressions throughout their pursuit of engineering in high school,

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[32] Nadal's (2018) case study of a woman who was promoted to senior executive only to find herself facing a new level of microaggressions and goes on to develop trauma symptoms inspired this discussion.

university and at work. However, in my research, women's experiences of suffering started with the awareness of a threat. Review of my findings in relation to microaggressions suggests two ways in which a threat materializes. The first way a threat materializes for some of my participants is that their generally accepted and tolerated level of microaggressions is breached. For example, Nicki is faced with escalated microassaults when her co-worker begins sexually harassing her. When Purl starts her first engineering position, she is subjected to numerous microaggressions unlike she had experienced at university. In both these cases, the microaggressions went above and beyond that with which they were used to coping. The second way the threat materializes is when they find that their usual way of coping with microaggressions is no longer accessible to them. For example, for Gabrielle, Diane and Christina, their threat materializes when they realize their high standard of performance cannot be sustained. Gabrielle and Christina also face the threat of no longer being able to cope by fitting in as "one of the boys" when they become mothers. In other words, the women engineers were used to a certain level of microaggressions that they either didn't notice (because they seemed so normal to them) or they were adept at handling (because they were part of their practicing gender "almost effortlessly" (Martin, 2003, p. 354)). In addition, the price they were paying likely didn't register for them as too high. When they perceived a threat, it was because the microaggressions became more visible or overt or their learned way of coping became unavailable for them or failed them. This new perspective suggests that all women engineers are at risk of suffering in the workplace.

Implications for Further Research

If we accept that engineering is rife with gendered microaggressions and that women engineers cope with them on a regular basis, then it is easy to agree that they take their toll.

Whether the toll goes unnoticed, or it has been calculated as "worth it," women engineers appear to be at risk of escalating pain and suffering. This shift can happen when microaggressions escalate or when their ability to cope is no longer available to them. My literature and research findings surface the following questions for further research:

- How can microaggressions in engineering be reduced?
- How might women engineers learn to identify and address microaggressions effectively?
- How might women engineers learn to recognize the toll that microaggressions are taking on them?
- What process do women experience over time as they cope with their threatening context?
- How might women engineers recognize when they are at risk for escalating pain and suffering?

Provocative Insight #3

The nature of the profession may intensify women's experience of microaggressions. Some features of the engineering profession are likely to influence how women engineers experience the covert dynamics of microaggressions. Some features discourage their visibility, some influence the invalidation of women engineers' sense of reality, and some deter speaking up about them.

Discourage Visibility. As I have mentioned, acts of discrimination have become more covert over the years. Microaggressions are powerful because they are embedded in norms and often go unnoticed (Sue, 2010a). Because women engineers have often been found to not "see" gender despite the overwhelming evidence of its gendered culture, they may be more prone to

not “see” microaggressions. For example, a woman engineer may not realize that a subtle comment or gesture that signals she is less technically competent is a microaggression. Perhaps because she did not grow up “tinkering,” she may internalize the related macroaggression and believe that she is less technically capable than her male colleagues. By believing that engineering is gender neutral, as many do, women may not perceive this and other gendered engineering macroaggressions and blame themselves for not meeting the standard.

In addition, women engineers’ coping strategies may prevent them from seeing microaggressions. One dominant strategy women engineers use for coping with microaggressions with their male-dominated environment is to perform to a high standard. Faced with inequity throughout their education and a weed-out culture in engineering education (Dryburgh, 1999), women who graduate and go on to practice the profession are likely those who are exceptional. Despite having to overcome many hurdles, women outperform their male counterparts academically in university (McIlwee & Robinson, 1992). On its face, this feature may provide an advantage to women and can certainly contribute to their success. However, this coping strategy does not change the status quo (Sue et al., 2019), may account for the higher rates of burnout in women engineers in comparison to men (Hall et al., 2015; Ronen & Pines, 2008), may cause women to blame themselves if they make mistakes, and may also cause them to avoid taking healthy risks. In addition, while they are busy proving themselves and performing to a high level, they may not notice the microaggressions and blame themselves for any failure to achieve their impossible standard. For Gabrielle, who admitted she had never seen gender in engineering before becoming a mother, she did not notice that the repeated comparison of her to a “superstar” female colleague was a microaggression, where the underlying message was that she is not good enough unless she achieves such an unrealistic standard.

Given that microaggressions are "subtle forms of discrimination" (Nadal, 2018, p. 11), and are often invisible, it is likely that rates of gender discrimination are higher than reported. For example, in the province of Quebec, Canada, the number of women engineers who experienced discrimination in their career might be even higher than the 45% reported (Ordres des ingénieurs, 2022). In addition, if women engineers tend to not see microaggressions as often as the woman in the general public, then it is possible that the rates of discrimination are even more than three times what is experienced by women in the general public.

Invalidate their Sense of Reality. Some evidence suggests that the engineering context may exacerbate women's sense of confusion and their questioning of reality when they experience microaggressions. In Faulkner's (2000b) study on dualities in engineering, she found that engineers often have a penchant for black-and-white, cause-and-effect thinking. In other words, they tend to believe there is a right answer and a wrong answer. This may lead the perpetrators of microaggressions to have less tolerance for entertaining discussions of multiple realities, which usually exists for microaggressions. Coupled with engineering's cultural belief in masculine rationality as superior to feminine irrationality (Hacker, 1981), in a "clash of realities" (Sue, 2010a, p. 11) with any accusation of irrationality, women engineers may also be inclined to distrust their alternative reality.

Johnson et al. (2021) highlight forms of secondary microaggressions that serve to invalidate the targets of microaggressions when they speak up about an initial or primary microaggression. They include *victim blaming* (where the victim of a microaggression is blamed) and *gaslighting* (where the perpetrator intentionally or unintendedly invalidates the reality of others with whom they have a relationship). Unique features of the engineering culture may contribute to such secondary microaggressions. Like primary microaggressions, victim blaming

is linked to stereotypes that "justify" the blame and engineering stereotypes can play a role. They can also happen when the victim is unable to clearly articulate their experience, as in my study, and the perpetrator cannot relate to it.

Gaslighting also depends on stereotypes. According to Sweet (2019), who studied the experiences of abused women but extends her analysis to others including those in mentor/mentee relationships, gaslighting is a power-laden, covert dynamic. It is embedded in a social context where gender stereotypes are exploited to manipulate women's sense of reality. She found that most prominent in the gaslighter's strategy is to leverage the stereotype of women as irrational. Calling a woman crazy, overly emotional, or irrational disrupts their sense of knowing and trust in themselves. In engineering, other macroaggressions can also be leveraged to shake women's sense of reality. For example, beliefs that engineering is gender neutral, technology is masculine, and real engineers are rational can all be manipulated to undermine women's sense of reality. As I have shown, even women engineers have labelled their women colleagues as paranoid for calling out sexism (Rhoton, 2011). Williams (2021) describes women in the oil and gas industry, including engineers, as victims of organizational gaslighting. Whereas oil and gas companies claim to support diversity and are seemingly puzzled why women leave in greater numbers than men, they deny that layoffs disproportionately affect women. In my study, suffering involved a questioning of reality. Christina provides several examples of trying to share her reality only for it to be invalidated or dismissed by her male colleagues.

If the dominant narrative is that women are welcome and that women have an equal opportunity to be successful in engineering, then the one who suffers is outside the norm. In other words, if she is suffering, it is her fault. She might spend her career trying to answer the

question, “what’s wrong with me?” rather than focus on the systemic things that are at play in the engineering environment.

Prevent Speaking Up. My research found that women in engineering struggle privately and alone, likely because of shame. It is reasonable that people generally suffer in silence since Frost (2003) found that suffering in organizations is often equated with weakness. Because Brown (2012) found that the number one shame trigger for men is being perceived as weak, it appears likely that women in engineering, who often adopt masculine traits or downplay their femininity, may find weakness especially shameful. As a result, they may be particularly vulnerable to staying silent and, like my participants, they tough it out. In addition, Charmaz (1999) suggests that those who suffer sometimes anticipate being blamed for their suffering. As mentioned earlier, victim blaming relies on stereotypes, including those of woman engineers, and worries of victim blaming can exacerbate women engineers’ fear of speaking up. One reinforcing consequence of not speaking up about microaggressions is that women engineers do not get the benefit of hearing other perspectives on their experience. Without speaking up or even talking to others about their experiences, it is difficult to make sense of any confusion about their reality. Without others hearing our shameful stories and responding with empathy, our shame tends to persist (Brown, 2006).

Implications for Future Research

The engineering environment appears to make it especially challenging for women to cope with microaggressions. My literature and research findings surface the following questions for future research:

- In what ways does the engineering environment influence the experience of microaggressions?

- What unique aspects of engineering prevent women engineers from "seeing" microaggressions?
- What unique aspects of engineering contribute to women engineers' experience of the secondary microaggression of invalidation?
- Given engineering's cultural beliefs about rationality, when faced with a situation where it is ambiguous whether one has just experienced a microaggression, what are effective ways of working through it?
- How can women engineers be encouraged to share their experiences of microaggressions with trusted others to make sense of them?

Provocative Insight #4

There is an underestimation of the price women engineers pay while coping with their threatening context. Although there seems to be agreement that the male-dominated culture of engineering places an additional burden on women (Adams, 2019; Cardador & Barker Caza, 2018; Hacker, 2013; McIlwee & Robinson, 1992; Ordres des ingénieurs due Quebec, 2022), I have found little research on the impact on women engineers as they cope with their environment and after they have exited a particularly difficult one. Although we know that women engineers leave the profession at a higher rate (Hunt, 2016) than their male colleagues, their pain and loss seem to be underestimated or even denied as the mystery of how to retain them plays on. Unsurprisingly, Hatmaker's (2013) and Cardador and Barker Caza's (2018) use of the commonplace words "strain" and "stress" to describe what women engineers experience does not seem to raise any alarms.

In my study, my participants recounted experiences of tremendous pain and serious losses. Six women engineers self-identified as having experienced suffering in the workplace,

defined as “an intensely painful experience of loss of self and powerlessness that derives from an accumulation, over time, of demeaning incidents at work and their subsequent negation and cover-up.” Their pain and losses included damage to their confidence and self-esteem, deterioration of their physical and mental health, and hampering of career and financial opportunities. Although it’s not clear the extent to which other women suffer because researchers have not asked them about it before, my participants’ suffering in silence raises sobering questions about the potential impacts of the male-dominated engineering culture on women.

The pain of microaggressions is also often underestimated. The use of the term “micro” was meant to signify microaggressions’ everyday nature and not meant to imply that they are harmless (Sue, 2010a). Researchers have found that microaggressions can accumulate and be quite injurious to our mental and physical health (Sue, 2010a; Nadal, 2018). In my study, although my participants were not explicitly asked about microaggressions, my findings were consistent with their hidden dynamics. For some of my participants, the microassaults they experienced were overt and egregious. For others, the microaggressions were hidden. Consistent for all my participants was that they suffered. Nadal (2018) has suggested that the accumulation of microaggressions can lead to symptoms of trauma, as may have been the case for my participants.

Researcher’s and others’ tacit assumptions may contribute to the understudy and underestimation of women engineer’s pain. First, because of the strong link between technology and masculinity, there may be the uncritical perception that women leave the profession because of the nature of the work. But as Evetts (1998) found, it’s not the work of engineering that’s difficult, it’s the environment. A second reason that women engineers’ pain is underestimated may be due to the assumption that women are more sensitive than men. However, Taylor’s

(2016) study on token women suggests that they experience chronic stress due to their gendered workplace climates and that women are not more sensitive than men to social exclusion and minority status.

Implications for Future Research

The understudy and underestimation of women engineers' pain leads to the following questions for further research:

- What price do women engineers pay as they cope with the male-dominated engineering culture?
- What price does society pay as women cope with the male-dominated engineering culture?
- What role does the engineering culture play in women's experiences of microaggressive trauma?
- What assumptions do researchers take for granted that contribute to the understudy and underestimation of the pain that women engineers experience in the gendered environment?

Provocative Insight #5

Women engineers who experience suffering in the workplace may be trapped in shame. Shame is a painful, complex, emotion. When most people think of shame, they think of it in the vernacular sense, "a painful feeling of humiliation or distress caused by the consciousness of wrong or foolish behavior" (Oxford, n.d.). They think of it as a conscious emotion resulting from a crisis (Scheff & Retzinger, 2000), which is correct, but incomplete. Lewis (1971) found that shame is experienced to varying degrees of awareness, from the acknowledged crisis of shame (overt shame) to shame feelings that are not identified as such (overt, undifferentiated shame),

and finally to undetected experiences of shame (covert, bypassed shame). She also found that shame is often expressed in its denial, particularly with anger.

Brown (2006) conceptualizes shame as having psychological, social, and cultural components. While we experience shame internally (psychological), it is intimately linked to connection and belonging (social), as well as cultural expectations (cultural). Defined as "an intensely painful feeling or experience of believing we are flawed and therefore unworthy of acceptance and belonging" (p. 45), shame involves the real or imagined judgment of an important other and a threat to the social bond (Lewis, 1971; Scheff, 1988). Shame has been conceptualized as playing a key role in cultural conformity in society (Scheff, 2014) and in social control in organizations (Creed et al., 2014). Brown (2006) also found that there are no universal shame triggers, but that there are patterns of shame triggers related to cultural expectations that suggest who belongs and who doesn't. Particularly relevant to my study, women are vulnerable to *unwanted identities* (Ferguson et al., 2000, as cited in Brown, 2006) related to work. It is likely that women engineers experience shame in relation to the expectations of engineering's culture and engineering's unwanted identities (e.g., feminine, irrational, not a tinkerer, and others). It also supports Wilson and VanAntwerp's (2021) finding that women engineers' fundamental need for belonging is thwarted in the masculine engineering environment and their lack of belonging undermines their success.

Broadly speaking, my participants appear to have been trapped in shame. Just as was implicit in my participants' experiences of suffering, Brown (2006) found that those experiencing shame were caught at the intersection of "being trapped, powerless, and isolated" (p. 45). Further, feeling trapped in shame, they perceive a narrow set of intolerable options and no way of meeting others' expectations. They feel powerless to cope effectively because their

shame is either outside of their awareness (covert, bypassed shame) or it is confusing and of unknown origin (overt, undifferentiated shame). They also feel painfully isolated as a result of feeling trapped and powerless. Ultimately, as my participants generally experienced, Brown (2006) found that with shame, women are trapped, powerless and isolated with no viable options and in a web of competing expectations that cannot all simultaneously meet.

More specifically in my study, only Gabrielle, Nicki, and Purl each explicitly name shame. However, all participants likely experienced overt undifferentiated or covert bypassed shame. By drawing on Retzinger's (1995) vocabulary of shame, I reviewed my study's interview transcripts and found many such expressions that signal shame.[33] For example, Christina shares her fear of being "looked down on" as she contemplates having a child and later cannot possibly meet the expectations of being both an employee and a mother. By taking a broad view of my study findings and a close view of interview transcripts, it appears as if my participants were trapped in shame.

Implications for Future Research

If women engineers who suffer are trapped in shame, then the following research questions emerge:

- What unique shame triggers exist for women in engineering?

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[33] Retzinger (1995) developed a vast vocabulary that expresses shame by drawing on the work of Lewis (1971), who found that therapy patients used common verbal and non-verbal expressions that involved imagined judgment of another and the fear of rejection (shame) as well as anger (denial of shame).

- What unique challenges does the engineering culture place on women in their development of shame resilience (Brown, 2006)?
- What is shame's role in encouraging conformity and maintaining the status quo in engineering?
- What can be done to help foster a sense of belonging in engineering?

Provocative Insight #6

The denial of gender in engineering is a social defense against disruptive change. It is a striking contradiction: there is overwhelming evidence that engineering is a male-dominated profession with a culture that systematically disadvantages women while, at the same time, many engineers believe the myth that engineering is gender neutral.[34] Several scholars' work supports the idea that this contradiction helps maintain the status quo. For example, Franzway et al., (2009) found engineering managers agree that there is a problem with attracting and retaining women but skillfully deny that inequality has anything to do with it. Citing Tuana's (2004) work on the epistemology of ignorance, they suggest that this contradiction in engineering is the result of the denial of power in gender relations.

Padavic et al.'s (2020) research inspires another possible explanation for the persistence of gender inequality in engineering. Their research findings support the notion that an undisputed narrative about women and work serves as a social defense against change. Specifically, the narrative that women's family commitments conflict with the gendered structure of work goes

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[34] With the exception of Franzway et al. (2009) whose research included 41 women and 10 men, all the research that I reviewed found that engineers believe engineering is gender neutral had participants who were women.

unchallenged despite evidence to the contrary and acts as a "substitute ('presenting') problem" (p. 67) and maintains gender inequality. They suggest that the presenting problem is ultimately unsolvable as the underlying problem remains invisible. Similarly, it is feasible that the near obsession with attracting and retaining women in engineering serves as a presenting problem that keeps the systemic inequality within engineering hidden.

Another explanation for this contradiction is that it is the result of defensive routines (Argyris, 1993). According to this research, when we experience threat or embarrassment, what we say we would do (our espoused theory) is often incongruent with what we actually do (based on our theory-in-use). In addition, we are unaware of this difference. As a result, people are caught in a "powerful circular loop" (Argyris, 2010, p. 15) or hidden trap that maintains the status quo. Engineers' apparent contradiction between their espoused theory (i.e., engineering is gender neutral) and their theory-in-use (i.e., engineering is masculine) may serve as a defence against the threat of change in engineering. For men, this may mean that their sense of identity and superior status are threatened. For women, this may mean that they would have to risk ostracization or give up their existing strategies for coping.

Gabrielle's experience provides an illustrative example of a defensive routine where her experience of systemic gender discrimination in engineering is skillfully outside her awareness. In her interview, she declares that it has never occurred to her that being a woman in engineering made any difference until she became a mother. She goes on to attribute much of her experience of suffering to not being able to work long hours because she must pick up her daughter at daycare. This constraint, as she told it, results in her "heavy" feeling of continuously having to play "catch-up." Despite conceding that she could do the job, that no one actually said she was slow or told her that her leaving early was a problem, she feels slow and like an "outcast."

As the interview progresses, her defensive reasoning begins to be revealed when she concedes that her heavy feeling started when she began her job six months before she even became pregnant. When asked why she didn't stay late in those early months, she is initially stupefied and can't answer the question. She then offers several reasons in quick succession: she wasn't used to staying late, she didn't like to stay late, she had been told the job was not more than 40 hours per week, and finally, she was taking a night course and couldn't stay late. In fact, in her second interview, she reveals that her heavy feeling was worse in those early months. For Gabrielle, aside from being a mother, there is no difference between being a man or a woman in engineering. Although she describes persistent gendered microaggressions that she experienced (e.g., "everybody" questioned her choice of the most difficult engineering discipline, her colleagues "constantly" compared her to the "superstar" who she was replacing on maternity leave), Gabrielle does not entertain the idea that her incredibly high standard is a coping mechanism for the invisible, gendered microaggressions that she experienced throughout her lifetime and on the job.

The work of Franzway et al. (2009), Padavic et al. (2020), and Argyris (1993) support the idea that denial of gender in engineering is a defence against change. Shifting from denial to acceptance is more than simply acknowledging that there are a few bad apples in engineering, as many engineers already do (Franzway et al., 2009; Seron et al., 2018). It means accepting that there is a system of oppression that is hidden and powerful. And change would mean achieving true equality and letting go of stubborn macroaggressions that give engineering much of its identity and status. Unfortunately, while some women cope "successfully" by distancing themselves from the sexist nature of engineering while they themselves thrive or simply survive, other women are suffering. It's not enough for women to "see" the gendered nature of

engineering because they know, at a certain level, that to "act" on it is dangerous. That's what prevents them from "seeing it" in the first place.

Implications for Future Research

With the denial of gender as a defense against change, the following research questions emerge:

- To what extent do engineers deny gender in engineering education? In the profession?
- How is the denial of gender in engineering maintained?
- How might scholars and practitioners reframe the problem of attracting and retaining women in engineering to generate change?
- What change would encourage gender equality?
- What dialogue among engineers would be helpful in addressing sexism in engineering?
- How might men engineers be encouraged to be anti-sexist?
- How might women engineers be encouraged to develop their feminist identity (Downing & Roush, 1985)?

Implications for Practice

In Chapter 4, three systemic change strategies were identified. They include: (a) updating engineering education so that students become more aware of the marginalization of women and other non-dominant groups in engineering, (b) expanding engineers' professional ethical responsibility to include social justice, and (c) embracing intersectional feminism, as McIlwee and Robinson (1992) proposed 30 years ago. In addition, this chapter's detailed discussion of the results suggests further implications for practice for engineering professional bodies and industry.

My findings and analysis support the following recommendations to both professional bodies and industry. First, acknowledge the profession's threatening context where it is not "normal" to be a woman in engineering and where systemic marginalization of women and members of other non-dominant groups is largely hidden. Quebec's Order of Engineers recent member survey results (Ordres des ingénieurs, 2022) is a good start at providing balanced communications that both celebrate women in engineering and acknowledge the truth of engineering's discrimination of women.

Second, stop encouraging coping mechanisms, such as telling women to deny gender in engineering and work harder. Touting the accomplishments of women while giving the false impression that hard work and denial of gender are the path to success only encourages potentially costly coping mechanisms and maintains the status quo. From my observations, many articles promoting women in engineering share the same story arc: I am a successful woman in engineering - sure I have challenges, but instead of complaining about them, I work hard to prove myself and you should too. This narrative suggests that women engineers' collective hard work will one day prove that we're good enough to the "bad apples" in the profession and the challenges will disappear. Given the potential price for coping and the slow pace of change, this story needs to change to reflect the truth of women's experiences.

Third, support research on macroaggressions and microaggressions in engineering. My research has identified the scarcity of research on microaggressions in engineering and several harmful macroaggressions that are likely unique to the profession. By studying microaggressions in the profession, we would find a more accurate picture of the hidden discrimination women face in the profession and we would identify effective ways of addressing microaggressions. By

studying macroaggressions, we would find and challenge the underlying cultural assumptions of the profession that "justify" microaggressions.

Fourth, raise awareness about engineering specific macroaggressions and the hidden dynamics of their resulting microaggressions. All engineers, regardless of gender, must work to become aware of what they take for granted as "normal" in engineering and stop perpetrating microaggressions. Beliefs about what constitute a "real engineer" must be challenged. Is an engineer necessarily a natural tinkerer? Does an engineer have to be "one of the boys?" Can an engineer also be "artsy?" Engineering will change when underlying beliefs about who is a better fit are challenged. In addition, it would be helpful to women to learn to recognize microaggressions and respond effectively to them.

Finally, develop an inclusive vision for engineering that is paired with an honest assessment of the current environment and goes beyond performative expressions. The vision should include what it means to be a professional engineer. For example, it might mean to be an engineering activist who is aware of and challenges the profession's macroaggressions, is open to feedback, and actively fights against marginalization. It might mean to work towards a profession that understands and respects the social component of their work process and work output.

Conclusion

In this thesis, a shift from blame to systemic thinking allowed for new possibilities to present themselves. In my autoethnography, when I shifted from self-blame to a focus on cultural criticism (Spry, 2011), I began to see cultural aspects of my experience that had been hidden from me. In my phenomenological study, when I bridled my judgment and was open, I found that my participants' experience of suffering was not the result of personal weakness, but of

feeling trapped in a threatening context and with an impossible problem to solve. Without blame, I found that women in engineering cope with microaggressions and have the potential to suffer should their microaggressions escalate or their coping mechanisms fail them. While they cope, they pay a price and risk their health and wellbeing. Further, it seems as if women have had to bend to fit in while the denial of systemic inequality has helped maintain the status quo.

For as long as women have practiced engineering, they have done it on men's terms. *Now, with so many calling for more women in engineering, with such slow progress, and with women suffering, it is time to reject that women need to change to fit into engineering – it is time to change engineering*. As long as underlying beliefs about who belongs in engineering are unexamined and unchallenged, progress will continue to be slow, and our economy will not meet the future demand for engineers (Engineers Canada, n.d.-b). My participants self-identified as having suffered as women in engineering and, in telling their truth, provided a window into the hidden, gender-exclusive dynamics of engineering that prevent women from full and free participation in the profession. Gina Cody, an engineer for whom Concordia University's engineering faculty is named, sums it up well:

> The main issue women have entering male-dominated fields isn't that there aren't any other women. It isn't that women are inherently uninterested in those fields. The issue is these environments are often actively hostile to women. Whenever women have "trespassed" on traditionally male territory, they have been made unwelcome. (Cody, 2022, "Ongoing setbacks," para. 5)

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Appendix A

Certificates of Ethical Acceptability

Figure A1

Certificate of Ethical Acceptability: Autoethnographic Study

UNIVERSITÉ Concordia UNIVERSITY

CERTIFICATION OF ETHICAL ACCEPTABILITY
FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant:	Ann-Louise Howard
Department:	Faculty of Arts and Science\Applied Human Sciences
Agency:	N/A
Title of Project:	How to be Good: One Woman Engineer's Experience of Suffering in the Workplace
Certification Number:	30015204

Valid From: July 07, 2021 To: July 06, 2022

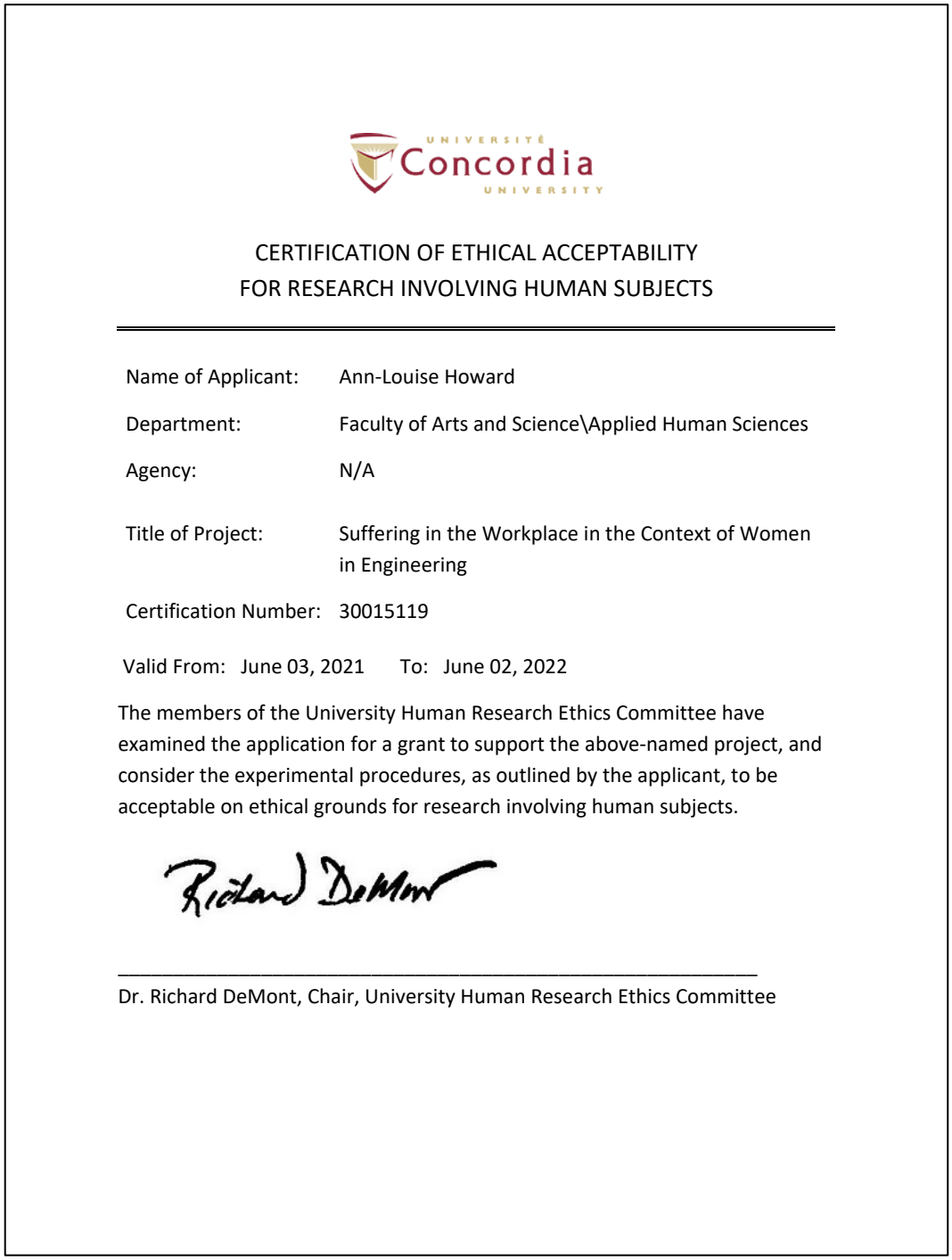
The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Richard DeMont

Dr. Richard DeMont, Chair, University Human Research Ethics Committee

Figure A2

Certificate of Ethical Acceptability (Primary Research on Women Engineers' Experience of Suffering in the Workplace)



UNIVERSITÉ Concordia UNIVERSITY

CERTIFICATION OF ETHICAL ACCEPTABILITY
FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant:	Ann-Louise Howard
Department:	Faculty of Arts and Science\Applied Human Sciences
Agency:	N/A
Title of Project:	Suffering in the Workplace in the Context of Women in Engineering
Certification Number:	30015119

Valid From: June 03, 2021 To: June 02, 2022

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Richard DeMont

Dr. Richard DeMont, Chair, University Human Research Ethics Committee

Appendix B

Interview Protocols

Autoethnographic Study

The participants will be read excerpt(s) from a draft version of the autoethnographic text and asked the following questions for each excerpt:

- Main Questions:
    - What is your reaction to hearing this story? Please share any thoughts, feelings, or sensations that you experienced, whether positive or negative.
    - What, if any, aspects of the story might be uncomfortable for you if others were to know about them?
    - If you were to tell this story that is more reflective of your point of view, what would that story be?
- Sample Follow-up Questions
    - Can you say more about that?
    - What do you mean by <insert participant's word>?
- In addition, spontaneous questions, based on participants' responses, may also be used.

Before reading any text, the researcher will share the focus of the autoethnographic text and share why the excerpt is relevant to the focus.

Primary Research on Women Engineers' Experience of Suffering in the Workplace

In order to explore the research question, *how does suffering in the workplace manifest for women in engineering* using reflective lifeworld research methodology, prescribed questions are discouraged. Instead, Dahlberg et al. (2008) suggest:

> A researcher's task is to cultivate a productive dialogue that addresses the phenomenon as deeply and thoroughly as possible. With this goal in mind, questions and comments should be a matter of the researcher's spontaneity and commitment during the interview, but all the time lead by the phenomenon. (p. 187)

I developed a tentative interview protocol before the start of the research and refined my interview plan for each participant.

Tentative Interview Protocol

With this approach in mind, the following interview questions were provided as the tentative interview protocol. In this protocol, the opening up and directing questions are generally open ended and the conversation is led by the participant, while the follow-up questions are more focused and lead by the researcher.

- Opening up Question
    - What's it like to experience suffering in the workplace?
- Directing Questions
    - What is it like to struggle to cope with one's suffering in the engineering workplace?
    - What is it like to struggle to relieve one's suffering in the engineering workplace?
- Follow-up Questions
    - Can you say more about that?
    - Can you give me an example?
    - Can you tell me about another time in your life when…?
    - What did that mean to you?

- What do you mean by <insert participant's word>?
- In what way was your manager <insert participant's word>?
- How was your work environment <insert participant's word>?

Sample Refined Interview Plan

As described in Chapter 2, each participant's interview plan was further refined after a review of their critical situation narrative. The opening, directive, and follow-up questions were focused on the moments described in the critical situation narratives. Here, I provide one sample interview plan developed for Nicki's first interview. Words in quotation marks are taken directly from my field notes.

Nicki's critical situation narrative centered on one critical incident but included descriptions of her experience that lead up to the incident and followed it. On August 30, 2021, I made a simple timeline of experiences in my field notes and distinguished them as happening before and after. Example notes that were put on the "before" side of the page included: "suppressing emo's," "test the waters," "Nicki, I got to tell you something w/ fight or flight senses tingling," "isolated and alone," "dirty secret," and "gut feeling my mgr would react negatively…would laugh or say it's my fault." Example notes that were put on the "after" side of the page were fewer and included, "left angry, ashamed, embarrassed," "didn't block him on text," and "feelings stay for years." These became moments that I prepared to explore in the interview.

I determined a tentative plan. I wrote in my notes on September 16, 2021, "Her critical situation narrative starts quietly and rises to a crescendo of pain and suffering. Where do I start?" Her critical incident involved such an egregious offense that I was deeply curious about its impact and sensitive to not causing her further pain. I decided to start with the end and the

"feelings that stay for years." I wanted to know, "After the incident, what was it like? What was the experience of "protracted distress" like?" I then planned to let her select the relevant experiences that she would like to explore, "Go back to significant moments that she chooses? (from CSN or not)." With openness and curiosity, I then began the interview with this tentative interview plan and my timeline.

Appendix C

Overview of Research Process