



Creating Counterspaces in Canadian Engineering Education: Moving to the Center

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ABSTRACT

Background: In engineering education, the cultures of engineering and academia intersect in ways that can impact a scholar's sense of value and belonging within their institution. This is especially true for women and gender minorities due to the reification of historically masculine values within these cultures. Counterspaces are spaces within institutions where minoritized community members can feel supported and valued. The limited formalized pathways and supports for engineering education mean these counterspaces are critical sites for scholars to grow the field.

Purpose: We explore how the creation of engineering education counterspaces is shaped by gendered norms.

Approach: This work employs collaborative autoethnography. Through two iterative cycles of data collection, we composed written responses to reflective prompts, meeting weekly to discuss our experiences. We drew upon an expansive meaning of "gender" from feminist literature that allowed us to interrogate disciplinary norms, performances, and expectations within the data. Multiple rounds of coding led to the emergence of cross-cutting themes.

Findings: We create counterspaces through feminized networks of support and collaboration with people, often women, who share our values. Caring labor plays an important role in building and maintaining these counterspaces, which intersects with our different desires to take on or avoid the role of "mother" in the academy. Gendered values in institutional processes, such as tenure and promotions, can create challenges when trying to push counterspaces towards the center of academic institutions.

Conclusions: In creating and maintaining counterspaces *for* and *within* engineering education, we must consider gendered norms within engineering education, engineering, and academia. This is especially important as we attempt to move these counterspaces "towards the center" so that we do not further marginalize minoritized faculty members and students who count on these counterspaces to survive and thrive.

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INTRODUCTION

Engineering education as a formalized research field is relatively new in Canada (Seniuk Cicek et al., 2025), and most academics conducting engineering education research (EER) are doing so within traditional technical engineering faculty positions. Though the discipline is growing (Burke et al., 2020), Canadian engineering education-specific journals, conferences, research funding, and tenure-track positions are limited (Seniuk Cicek et al., 2024). The lack of institutional infrastructure, the relatively low number of scholars, and the differences in topics, methodologies, and dissemination between EER and traditional engineering research may lead engineering education scholars to feel that they do not fully belong within their engineering faculties, or that their work is misunderstood or undervalued (Hladik et al., 2023; Seniuk Cicek et al., 2020; 2023).

Gender plays an important role in these negotiations of belonging and engineering identity. Masculinized engineering cultures can influence how women and gender minorities enter and persist within engineering education and professional practice (Faulkner, 2009; Oldenziel, 1999; Riley et al., 2014). Faculty members in engineering schools must also contend with gendered norms and expectations within academia that impact how they and their work are perceived and supported within the institution (Blair-Loy & Cech, 2022; Lester, 2008). In this article, we – three women holding research-stream, tenure-track faculty positions in engineering education in a research-intensive Canadian university – respond to calls for more expansive ways to consider gender in engineering education (Haverkamp et al., 2020; Pawley et al., 2016) and reflect on our gendered experiences in these roles as we join and create counterspaces for engineering education in Canada.

Counterspaces (Solorzano et al., 2000; Ong et al., 2018) are sites where minoritized scholars can support each other and challenge deficit notions about themselves and their work. Thus, understanding how Canadian engineering education scholars create counterspaces both *for* and *within* engineering education remains of interest as we work to grow capacity in the field. Our research question is: How is the creation of engineering education counterspaces in Canada shaped by gendered norms? Following a collaborative autoethnographic approach (Chang et al., 2016), we took part in iterative cycles of reflective writing, discussions, and meaning-making to explore different aspects of our work along themes such as belonging, identity, and labor. We drew upon an expansive meaning of “gender” from feminist literature that allowed us to interrogate disciplinary norms, performances, and expectations.

During our initial round of data collection, we were members of an academic Centre focused on engineering education and professional practice. As our research progressed, the Centre transitioned into the first Department of Engineering Education in Canada, which was a significant accomplishment and source of pride for our national EER colleagues and us. Existing as a Centre and later a small Department within a Faculty of Engineering comes with challenges, particularly as our research and professional practice involve epistemologies, methodologies, and perspectives outside of those traditionally used within engineering. These tensions are further complicated due to the historically masculinized natures of engineering and the academy and the perceived femininity of the social sciences and humanities fields from which we draw. However, our findings emphasize how we leverage feminized networks of support and collaboration to create counterspaces that value us and the work we do. Caring labor also plays a considerable role in the creation and maintenance of these counterspaces. In our discussion, we explore how our work expands upon research in gender, engineering, and academia, and note the utility of counterspaces as a theoretical movement in engineering education. We close with reflective questions that colleagues, administrators, leaders, and students can use to ensure that those who are minoritized in engineering education are not left behind when these counterspaces “move towards the center” (Ong et al., 2018) of our institutions.

POSITIONALITY

Stephanie is a White, cisgender, Canadian woman who grew up in a middle-class household and has an engineer father. She lives with her husband and young daughter. Stephanie has an

interdisciplinary academic background in electrical engineering and educational research. For her PhD work, she drew upon feminist theory to critically interrogate the culture of STEM (Science, Technology, Engineering, and Math) disciplines to understand why minoritized learners may not feel they belong in STEM. During the first round of data collection (January 2023), Stephanie was in her first year of a tenure-track Assistant Professor position focusing on EER. She is still reconciling her emerging engineering education identity with her learning sciences identity. Her current research interests lie at the intersection of critical theory, engineering identity, and equitable design. She teaches undergraduate courses in Technical Communication and Technology & Society, and many of her service obligations are focused on EDIA (equity, diversity, inclusion, and accessibility) and social justice in engineering.

Kari also has interdisciplinary academic background, with training and work experience in engineering and Science and Technology Studies (STS). Her experience as a young woman working in a male-dominated engineering field and office was one of many contributing factors that led to her leaving engineering to pursue graduate studies in the humanities and social sciences: a choice which, at the time, she viewed as a departure from engineering. Nevertheless, Kari began her faculty career with a teaching appointment in an engineering school, and currently holds a tenure-track position in engineering education. During the first round of data collection, she was in her second year in this position. Kari is a White, cisgender woman of mixed European descent, who grew up in a middle-class household with no engineers in her immediate family. She is a daughter, sister, and spouse, and lives with her partner.

Jillian (Jill) is a White cisgender woman of European descent who is a mom of three adult children, a spouse, daughter, sister, and aunt. She is educated in the creative arts and education and is not an engineer. Her entry into engineering education came through the opportunity to do a PhD with an Assistant Professor who taught technical communication in the engineering Faculty in which she currently works. Following her PhD supervisor's retirement, Jill competed for and was hired into her supervisor's tenure-track research position. During the first round of data collection (January 2023), Jill was in her fifth year in this position, with a research focus in EER; during the second round of data collection (January 2024), she had been recommended for tenure and promotion. The stress of being the first faculty member with a research focus on engineering education to apply for tenure and promotion in her engineering faculty was immense. This research reflects her commitment to creating a counterspace for herself and especially for the first two authors, who are in the process of navigating their own tenure and promotion in engineering education in the faculty.

We wish to note the complexity and vulnerability in looking for gendered experiences in postsecondary STEM settings. Ahmed (2021) writes, "it is possible to identify as a feminist and worry that gender is an imposition" (p. 104). Even with our own wealth of personal experiences as women and academic grounding in feminist literature, there were many times throughout our analysis where we wondered if a particular experience was gendered or not. We ask that the vulnerabilities we show within this work be received with the same care with which we worked to present them. The complexity in this analysis comes from the heterogeneity of our own experiences, the desire to avoid essentializing gender, and an acknowledgement that gender issues are not just women's issues. The dominance of the masculine values and norms we discuss can harm men just as much as they harm others across the gender spectrum. We recognize that our findings may not resonate with all early career engineering education scholars. That said, we believe that openly acknowledging the complexity and vulnerability in this work can lead to rich discussions about values and norms and the creation of engineering education counterspaces.

LITERATURE REVIEW

GENDER AND ENGINEERING

Even though "there is nothing inherently or naturally masculine about technology" (Oldenziel, 1999, p. 10), there are widespread cultural associations between technology, engineering, and masculinity that have evolved alongside our understandings of technology and gender.

Technologies, including those designed and used by engineers, frequently “incorporate symbols, metaphors, and values that have masculine connotations” (Wajcman, 2007, p. 289). These understandings of technology and gender solidified as North American engineering became professionalized during the late 19th and early 20th centuries, and barriers to entry for women became more explicit (Oldenziel, 1999; Secules, 2019). While these formal hurdles no longer exist for most women engineers in Canada, cultural associations between engineering and masculinity persist (Gill et al., 2008). For example, Secules (2019) noted how masculinity is reproduced through gendered dress, sexualized comments, and other social performances in engineering education spaces.

The idea of engineering as masculine is connected to conceptions of engineering as purely rational, technical, objective, and apolitical (Stonyer, 2002). In interviews with men engineering faculty members, Hacker (1981) found they distanced themselves from emotions and their physical bodies to focus on logic and machines, often ranking technical knowledge as more important than social relations or other stereotypically feminine qualities. Similarly, Pawley (2009) found that engineering faculty members viewed applied science and math, problem-solving, and making things, as central to engineering practice. Faulkner (2000) has also noted that, regardless of the gender of an individual engineer, technical skills, attitudes, and work (associated with masculine instrumentalism) are more highly valued in engineering than social competencies and tasks (associated with feminine expressivity). In fact, this duality is often seen as exclusive: engineers cannot be viewed as simultaneously technical and social (Faulkner, 2000). Women engineers particularly are challenged by this sociotechnical dualism, as they are simultaneously highly visible as women yet invisible as engineers (Faulkner, 2009), and their engineering identities may be more fragile as a result (Faulkner, 2007). Wajcman (2007) has written about how women pursuing technical careers “were being asked to exchange major aspects of their gender identity for a masculine version without prescribing a similar ‘degendering’ process for men” (p. 298), and Faulkner has demonstrated how engineering careers are often perceived as “authentic” for men and “inauthentic” for women (2009).

Attention to gender in Canadian engineering has largely focused on women’s participation in the field, rather than exploring engineering gender norms more broadly. Canadian engineering professional associations and academic programs have recognized a need to increase gender diversity since the 1990s (Engineers Canada, n.d., a). While progress has been made, women’s current representation in engineering still falls short of gender parity. As of 2022, 25.2% of undergraduate engineering students in Canada identified as female, along with 28% of postgraduate engineering students and 15% of licensed professional engineers (Engineers Canada, 2022, 2023). Years of minimal increase in gender representation indicate that Engineers Canada’s goal of raising the percentage of women among newly licensed engineers to 30% by the year 2030 is unlikely to be achieved (Engineers Canada, n.d., b, 2023). Women’s representation in academic engineering positions is also low: while 44% of Canadian postsecondary academic staff are women (Statistics Canada, 2025), in engineering that number falls to 19.5% (Cukier et al., 2024).

While these numbers are bleak, understanding gender in engineering requires us to look beyond numeric representation (Riley et al., 2014). The report, *More than just numbers* (Canadian Committee on Women in Engineering, 1992), was published roughly two years after the December 1989 massacre at l’École Polytechnique Montréal, during which a shooter who claimed he was “fighting feminism” singled out and fatally shot 14 women, 12 of whom were engineering students (Rise Up!, n.d.). This explicit act of misogynistic terrorism “jolt[ed] engineers and non-engineers alike into deep contemplation” (Canadian Committee on Women in Engineering, 1992) on the status of women in engineering. The report recognized that demographic underrepresentation is a symptom of a larger root cause, and unless cultural issues like systemic bias, accountability, and attitudes towards women engineers are addressed, efforts to change demographics will be fruitless.

GENDER AND HIGHER EDUCATION IN STEM

Alongside the gendered implications of engineering and other STEM disciplines, STEM faculty members must also contend with gendered aspects of postsecondary institutions. There are

widespread beliefs that women, especially those with childcare duties, are less devoted than their men colleagues to their research – even when statistics on publication rates and grant applications indicate that they perform equally (Blair-Loy & Cech, 2022; Trautner et al., 1996). Women faculty members in STEM may experience social isolation due to their gender, caused by negative collaboration and networking experiences, or a lack of opportunities to receive mentorship (Smith, 2014; Trautner et al., 1996). Appropriate mentorship may be hampered by gendered expectations. Specifically, men mentors may prefer to challenge their mentees and focus on competition and independence, which is at odds with typical socialization of women, which focuses on collaboration, dependence, and integration (Chesler & Chesler, 2002). Isolation can pose significant challenges to establishing a meaningful academic network, applying for collaborative grants, and learning how to navigate university structures and norms – all of which impact a faculty member's ability to gain tenure and promotions.

Social isolation is compounded by experiences of discrimination and harassment (Gunter & Stambach, 2005; Miner et al., 2019; Trautner et al., 1996). Even dressing for work poses challenges related to gender performance, as women may feel the need to dress professionally (but not too feminine) to retain authority and respect from students and colleagues in men-dominated disciplines (Lester, 2008). Trying to avoid stereotype threat (i.e., feeling the need to push back on stereotypes of women being less competent at STEM by striving for excellence) can lead to imposter syndrome and burnout (Burgess et al., 2012). Overall, this “chilly climate” in academic STEM (Hanson, 2020) has significant implications for the career trajectories and mental health of women faculty members in STEM.

There are also demonstrated gender differences in the types of work expected of faculty members. Women typically perform more service than men, even when controlling for factors such as rank and years of experience (Guarino & Borden, 2017; Trautner et al., 1996). In many cases, these service assignments may be due to a need for token representation in STEM faculties, especially for women of color (Kachchaf et al., 2015). This service work does not necessarily lead to leadership opportunities which bolster promotion applications (Xu, 2008); for example, women may participate on committees but not chair them (Mitchell & Hesli, 2013). In addition, women may be penalized for doing equity-related work, facing hostility or devaluation from colleagues due to this work's conflict with dominant narratives of STEM disciplines as objective and apolitical (Blair-Loy & Cech, 2022; Cech & Sherick, 2019). Navigating the heavy load of service work, alongside the nature of EDIA and social justice work, requires emotional labor (Hochschild, 1983). Women and faculty members of color who carry out a disproportionate amount of equity-focused work must manage the emotional toll in indifferent or hostile environments. However, this service work may provide women with opportunities to engage in meaningful interactions and create connections with other women colleagues (Bird et al., 2004). This has implications for how STEM faculty members build their professional networks, which are often gender homophilous (Belle et al., 2014).

Expectations about women faculty members' work may also come from their students. Students may perceive women as being more approachable for special treatment, such as asking for a make-up exam or grade adjustment (El-Alayli et al., 2018). Women faculty members may also feel an expectation to play the role of “mother” in terms of providing emotional support for students (Lester, 2008). Thus, women may be expected to do work in their role as faculty members that is valued differently (i.e., less) and may require more time than the work of their men colleagues.

Previous research focused on faculty members in engineering education has not strongly attended to gender. Coso Strong et al. (2021) explored early career faculty transitions in engineering education. Their results highlight the importance of negotiating the legitimacy of their engineering education work, which involved understanding their roles, establishing visibility, and finding purpose. However, gender is only briefly mentioned as a factor impacting a young woman faculty member's mistaken identity as a graduate student, which was a challenge to her establishing visibility within her faculty. Interdisciplinary scholars in engineering education must navigate tensions between the masculine nature of engineering and feminine nature of education (Bix, 2014). Building on Coso Strong et al.'s (2021) work, we believe that this masculine/feminine dualism may be contributing to the challenges in establishing the legitimacy of EER within engineering

faculties. This disciplinary gendering may compound existing discrimination and microaggressions faced by minoritized groups in engineering education. Work to create identify-affirming spaces for engineering education scholars must therefore attend to gender.

THEORETICAL FRAMEWORK

COUNTERSPACES IN STEM

In addition to exploring mechanisms of marginalization, many scholars have identified ways in which women, people of color, and others who are minoritized within STEM fields can build a sense of belonging. One way this can be accomplished is through counterspaces: sites where deficit notions about minoritized populations can be challenged, and “where a positive collegiate... climate can be established and maintained” (Solorzano et al., 2000, p. 70). While Solorzano et al. defined counterspaces in terms of racial and ethnic identity focusing on Black students’ experiences in the United States, other scholars have extended the notion of counterspaces to places of belonging for groups that are racially and ethnically mixed and minoritized in STEM (Ong et al., 2018). Counterspaces can help minoritized engineering students challenge stereotypes and make space for “counterstories” that acknowledge the complexities of their “whole selves” that do not align with the White masculine norms of the dominant group in engineering (Carll et al., 2024). While counterspaces traditionally exist on the margins of academia in the form of peer groups, mentoring relationships, and diversity-focused conferences, Ong et al. (2018) emphasized the potential to create counterspaces in central academic spaces, including at the department level, where marginalized students, faculty, and staff feel secure, have a critical mass of peers, and experience care for their well-being.

In counterspaces, we can push back on the dominant masculine norms in engineering and connect to people with similar values as we work to define the field of engineering education in Canada. For us as women faculty in a male-dominated and masculinized field, and for our graduate students, many of whom are women and/or racialized, counterspaces allow us to create our own structures and thrive within existing ones. Counterspaces allow people from marginalized groups “to be neither hypervisible nor invisible, but comfortably visible in identity conscious and identity affirming surroundings” (Carll et al., 2024, p. 22) – a possible solution to the in/visibility paradox articulated by Faulkner (2009). For us, these may be counterspaces *for* engineering education (i.e., spaces where engineering education norms and values can thrive within a traditional postsecondary engineering context), or counterspaces *within* engineering education (i.e., smaller niches within the engineering education community).

While the definition of counterspaces is applicable to any non-traditional group existing in the margins of STEM education spaces (Solorzano et al., 2000), we would be remiss not to acknowledge that Solorzano and Ong’s use of counterspaces center around the idea of race, as does much of the literature regarding STEM counterspaces. We believe that the lack of formal infrastructure for engineering education, low number of engineering education scholars, and low representation of women in engineering in Canada indicate that we are still on the margins when compared to the existence and demographics of traditional engineering departments. Our work aims to illuminate gendered norms around the creation of counterspaces *for/within* engineering education. However, as White women, we are members of the dominant racial group in engineering. This means that additional norms or expectations in engineering and academia connected to whiteness are less visible to us, and the counterspaces that are welcoming to us may still reify such norms. We emphasize Ong et al.’s (2018) call for additional scholarship focused on counterspaces for women of color in STEM education.

METHODS

COLLABORATIVE AUTOETHNOGRAPHY

Autoethnography has been positioned as a feminist method as it creates space for embodied emotions, raises oppositional consciousness, takes seriously the claim that the “personal

is political,” and can be committed to the future of women (Ettorre, 2016). Collaborative autoethnography (CAE) is a qualitative research methodology in which a group of researchers aim “to gain a meaningful understanding of [the] sociocultural phenomena” demonstrated by a variety of data (Chang et al., 2016, pp. 23–24). This meaning-making is carried out through the collective analysis and interpretation of researchers’ individual and collective work.

Research begins with data collection for sharing and probing the phenomena under study, often in the form of individual written responses to reflective prompts. This is followed by additional data collection for further sharing and meaning-making, such as recordings of group conversations. Data analysis and interpretation are then carried out to determine themes and prepare for dissemination. While these phases represent a general path for CAE research, CAE’s strength is in its emergent quality; it “should not be limited to a particular approach or style of representation” (Chang et al., p. 25), allowing researchers to follow emerging themes and iterate in ways that are appropriate for their research contexts and questions.

CAE was particularly useful for this research study as it created space for us to be both participants and researchers in the work. As women early-career EER faculty members, our perspectives and experiences formed a corpus of research data that we could collaboratively analyze to provide insights that answered our research question. CAE also provided space for conflicting perspectives, alternate viewpoints, and uncertainty, as we frequently asked ourselves: how is this related to gender? CAE enabled us to present our findings without erasing complexity.

DATA COLLECTION

The initial round of data collection took place in January-February 2023. We created a set of prompts that guided weekly reflective writing. We were interested in how we, as early-career EER faculty members, negotiated building an “academic home” for ourselves, as well as the affordances and challenges of our engineering education-specific positions. At that point in our research, gender was not an explicit topic of investigation. We crafted prompts (Table 1) that were open-ended enough to identify different emergent themes but still required us to discuss specific experiences and feelings.

WEEK	PROMPT(S)
1	What is our sense of belonging within our a) academic unit (i.e., the Centre), and b) our Engineering faculty?
2	What is our sense of belonging within the wider engineering education research community? What experiences have we had that contributed to building that sense of belonging?
3	What actions can we take that we think might contribute to building an academic “home” for ourselves? How do we talk about our positions and our academic unit to others, inside and outside of engineering education research?
4	What about these engineering education research positions drew us to apply for them? What do we like about our positions? What is challenging about them?
5	How do we balance our research, teaching, and service work?

Table 1 Prompts for first round of reflective writing and discussion.

We collectively wrote 35 pages (a mix of typed and hand-written) in response to these prompts. Each week, we met for an hour to discuss what we had written, asking questions about each other’s experiences and feelings, exploring alternate perspectives, and looking for similarities and differences. Most meetings were held in-person, with one online. Our meetings were audio-recorded and transcribed. We drew on this initial dataset to publish a conference paper focused on engineering identity and belonging (Hladik et al., 2023).

In September 2023, we had several discussions about what we could see emerging from the data, what questions we still had, and what we wanted to explore further. From November 2023 – January 2024, we used situational mapping (Clarke, 2005) to create a visual representation of the different elements, actors, constructions, issues, symbols, etc. within our data. From January-February 2024, we repeated our process of individual writing/reflection and group discussions

using the prompts in [Table 2](#). We were interested in how our responses to the previous year's prompts may have changed, so we chose to repeat some of our initial prompts and add additional prompts that responded to issues that were professionally pressing to us.

WEEK	PROMPT(S)	RATIONALE
6	What is our sense of belonging within our a) academic unit, b) our faculty, and c) the wider engineering education research community? What experiences have we had that contributed to building that sense of belonging?	To see how responses changed from the previous year
7	What structural, procedural, temporal, etc. elements facilitate or constrain our ability to do the work we want to do?	To help fill gaps in the situational map
8	Who do I think I am, professionally, right now? Who do I want to be, professionally? Why? How do I want to view myself, and how do I want others to view me?	In response to the need to tell a clear “story” about our professional work when applying for tenure and promotion, something that Jill had just gone through

Table 2 Prompts and rationale for second round of reflective writing and discussion.

These prompts led to 20 more pages of reflective writing and three hours of transcribed discussion meetings. Our data corpus includes 55 pages of reflective writing and eight transcripts of 1-hour discussions.

ANALYSIS

We held multiple meetings to review the data, return to our situational map, and reflect on what we felt were the most powerful aspects of the work. We noted that gender was implicated across our map: many of our human actors were women, masculinity and femininity featured in most notes related to sociocultural/symbolic elements (e.g., “education as a feminized field” and “engineering as a masculinized field”), gendered norms underlay many of the discursive construction of actors/groups (e.g., “finding my people” and “importance of the technical engineer”) and our major issues/debates (e.g., “how to reconcile different identities” and “how to belong when we are “twice removed”). Thus, gender became our focus for additional analysis.

Individually, we reviewed the data and coded broadly for “gender”, the only code used in this round, and, as a construct, purposely left undefined. Even though all three of us are women, our positionalities showcase varied lived experiences. In addition, each of us had different levels of familiarity with literature on gender theory. It was therefore expected that we would take different approaches to coding, resulting in different data being coded, or for the same data to be interpreted as connected to gender in different ways, with multiple, conflicting perspectives acceptable in CAE ([Chang et al., 2016](#)). We created space for these different interpretations, while collectively narrowing in on some general categories ([Table 3](#)).

CATEGORY	DESCRIPTION
How we build a home/ collaborate	How we work together with others, actual or desired. How we create a home for ourselves (physical, academic, etc.)
CAE as gendered methodology	The methodology of CAE feeling gendered and manifesting feelings of vulnerability but also feminized networks of support and collaboration within the research process.
Role of emotions/feelings	Embracing emotions/feelings, managing emotions (emotional labor; Hochschild, 1983), emotions involved in pushing forward EDIA and decolonizing work, etc.
Gendered relationships	Specific people we have relationships with (professional relationships, collaborations, citations, more friendly/personal relationships) as well as how we build and maintain those relationships. Can include a gendered sense of belonging.
Caring labor/care work	Mentoring students, caring about students, caring about EDIA and decolonizing work. (Drawing from Folbre, 1995)
Motherhood	Literal motherhood and figurative/emotional motherhood.
Engineering identity	Being positioned (or not) as an engineer, by self or others. Ideas of what engineering “is” or “should be.”
Other	Data that feels strongly related to gender but doesn't fit into the above categories.

Table 3 Intermediate categories and descriptions for second-round coding.

After merging our coded files (which included every individual coded instance of “gender”), we each individually re-coded the data with the categories in [Table 3](#). Each researcher also wrote memos about how well the categories fit the data, what was missing, and what tensions were emerging. We met again to discuss which categories resonated, which felt restrictive, and what broader themes were emerging. This collective meaning-making allowed us to understand our different perspectives and discuss tensions we felt both within the data and among our interpretations. With these discussions in mind, Stephanie went through the collectively coded data and created a summary of the main ideas and tensions within each category. Each researcher then drew on this summary and our previous discussions to determine overall themes, which we present in the Findings.

As we wrote this article, we continued to reflect on our emerging arguments, and additional experiences and ideas that were not included in our original data surfaced. We collectively agreed they provided additional context, nuance, or clarification to our points, and integrated them into the findings where appropriate.

FINDINGS

Our analysis shows how gender is intertwined with our work to create engineering education counterspaces. Feminized networks of support connect us with people who share similar values, pushing back on traditionally masculine values inherent in academic engineering spaces. Through these networks, we build counterspaces in the form of projects, such as this CAE, with our local group of engineering education researchers and students, and in dialogues with like-minded engineering education colleagues across Canada and beyond. We also note how caring labor is critical to building and maintaining these engineering education counterspaces. However, despite our success in creating local counterspaces for ourselves and our students, we experience challenges in creating more central counterspaces within our university, as we run up against masculine institutional and disciplinary norms that are more difficult to overcome at scale.

BUILDING COUNTERSPACES THROUGH FEMINIZED NETWORKS

A major theme that emerged from our research is how we created counterspaces for engineering education work through feminized networks of support and collaboration. We use the word “feminized” here to indicate that these networks included people who push back on masculine norms in engineering and/or academia, rather than being networks exclusively of women – though women were prominent in our data. Within these counterspaces, the traditional masculine norms that permeate our professional context, such as the prioritization of technical research over educational work, logic and efficiency over emotion, and competition over collaboration, were eschewed. We could also affirm shared values and express emotions and vulnerabilities in these counterspaces.

Connecting with Women

EERspaces are more gender-balanced than other engineering contexts, which tend to be dominated by men. Nevertheless, it is noteworthy that the colleagues, mentors, and sources of inspiration we mentioned in our discussions were almost exclusively women. Each of us has, intentionally or otherwise, created a professional network of women within and beyond engineering education. They included colleagues within our institution, office staff, graduate school friends, national and international colleagues, and women whose scholarship inspired us.

Stephanie was appreciative of having close women colleagues in a men-dominated faculty:

Stephanie: That was what drew me here... and the fact that because I have two, like my closest colleagues are [women] in what can be a very [men] dominated engineering building. That was also probably helpful [in making my decision to accept the job].
(discussion, Jan. 12, 2023).

In another discussion, we brainstormed ways to connect with women colleagues in our faculty through social events. These actions create counterspaces of support and solidarity in face of the “chilly climate” that women frequently face in academic STEM (Hanson, 2020).

Building Networks with Shared Values

Many of the women we work with share our values, both in terms of the types of work that we do (e.g., social justice work) and how we do it (e.g., valuing gratitude). We are not suggesting that *all* women share these values, nor that men are inherently uninterested or hostile towards social justice, decolonization, or critical pedagogy. In our experiences, however, we have built networks of support with colleagues who eschew masculine academic norms of hierarchy and competition; who value gratitude, support, and interdependency in collaboration; and who are most often women or gender minorities. EER may not be fully understood or valued by traditional engineering faculty members. Seeking engineering education colleagues with similar values allows us to collaborate in ways that feel personally meaningful, without feeling like we need to defend our work against deficit perspectives. As Stephanie noted in her reflection:

[Within the Centre,] I don't feel like I need to apologize or qualify my theoretical stances, epistemologies, methodologies, research questions, etc. (Stephanie, reflection, Jan. 12, 2023)

We discussed both counterspaces *for* engineering education within traditional academic engineering settings, as well as counterspaces *within* engineering education. Kari noted her discomfort with being labeled as an engineering education scholar in both rounds of data collection, as she felt more aligned with STS. Finding counterspaces within the engineering education community helped her mitigate that discomfort:

The sense of discomfort that I felt last year with the “engineering education” label has... not exactly resolved, but become less of a focus for me. I've found pockets of the engineering education world that also feel like home to me. (Kari, reflection, Jan. 23, 2024)

Other niches (i.e., counterspaces) we mentioned in our discussions included groups of people who value interdisciplinary work, the humanities, and Indigenizing and decolonizing engineering education. We recognized that while engineering education includes a wide variety of topics, methodologies, and epistemologies, we could cultivate connections between likeminded scholars to create a “home” for ourselves within the discipline.

Fostering close relationships with people who shared our values created counterspaces where we could be recognized and valued for our work. These counterspaces were especially important in the face of negative experiences in mainstream institutional spaces. Jill shared a painful experience that she had at an engineering industry event in her first year as a tenure-track faculty member. She was invited to this event by a woman colleague who felt her work on decolonizing and creating space for Indigenous Peoples in engineering education was valuable. However, Jill did not perceive that others recognized the value of her work:

Jill: When I finished [my talk about decolonizing engineering], the Dean [at the time] stood up to speak, and he introduced and praised two brand-new [men] faculty members, raving about their innovative technical engineering research, and completely ignored me, though I was the third new faculty hired that year. I felt completely invisible... (discussion, Jan. 12, 2023)

In this situation, Jill keenly felt that gendered norms in engineering (e.g., the importance placed on highly technical, objective research) and how the Dean at the time understood and was comfortable with these norms, led to her work being ignored. Jill's feelings were magnified due to the public nature of the event and the senior leadership position of the person who ignored her. This experience contrasts strongly with the positive reception Jill's decolonizing work has had within her professional network, and at national and international engineering education

conferences. Our feminized networks connected us to people with whom we could be reminded of the worth of our work.

Embracing Emotions and Vulnerability

Counterspaces allowed us room to express our feelings and vulnerabilities freely rather than having to manage them. We spoke about feeling the need to manage our emotions to fit into gendered engineering norms at work:

Kari: We exist in this engineering framework of being like, super quantitative, and needing to act like you know everything all the time, not vulnerable.

Jill: ... kind of [masculine] and non-emotional and yeah. (*discussion, Jan. 19, 2023*)

Specific examples of this emotional labor included feeling the need to restrict our words and actions to avoid hurting the egos of some colleagues and pushing down feelings of embarrassment when we were rebuffed. In contrast, we mentioned moments where we turned to women colleagues to vent our frustrations and receive emotional support.

Gendered perceptions of academic disciplines may influence how emotions are treated. In the following excerpt, Jill and Stephanie, both of whom have prior experience within the discipline of education, commented on differences they felt between engineering and education spaces:

Jill: You [Stephanie] had said your community is women, and that's a positive thing. But in the same way it's also like we're relegated to education, you know what I mean? The women [in our Engineering faculty] are in education. And then this feeling of how we're all willing to learn and talk about our vulnerabilities, and then you come across these other people [engineers] that are just so damn sure of themselves. And they're –

Stephanie: Very different. I remember when I went to my PhD program [in Educational Research] and we did an introductory meeting with everyone in the faculty, and I was like oh, everything is really warm and touchy-feely and weird here? And it was great, because it's a different type of environment [than engineering]... and I really appreciated that and so I hope we can continue to build that. (*discussion, Jan. 19, 2023*)

Both of us noted how people and spaces within education felt more welcoming to emotion than engineering contexts, and that this was something we valued.

In addition, we expressed gratitude for our CAE meetings as a counterspace and supportive environment in which we could discuss issues that we did not feel comfortable bringing up to other colleagues. They were spaces in which we could reaffirm the value we hold for highly reflective and interpretive research methodologies such as CAE, even as we worried about whether it would “count” as rigorous research within engineering or engineering education contexts. We found that our counterspaces for engineering education required less emotional labor and therefore we could focus more energy on our relationships and work.

THE ROLE OF CARING LABOR IN CREATING ENGINEERING EDUCATION COUNTERSPACES

We each repeatedly discussed how strongly we valued caring about and mentoring our students:

Jill: All the students I work with, from undergrad to all the way up to graduate students, I think the strongest thing I've been for them is that supportive mentor. (*discussion, Feb. 13, 2024*)

This care work – “labor undertaken out of affection or a sense of responsibility for other people, with no expectation of immediate pecuniary reward” (Folbre, 1995, p.75) – is important to all of us. While we believe this relational work is critical in creating counterspaces for engineering education, we noted that such work takes time away from the research activity necessary for us to achieve tenure and promotion, and from our personal lives.

We each voiced different perspectives on being identified as mothering figures through our care work. As we were analyzing the data, Jill reflected that she was comfortable with her role as a mother “bleeding into” her academic role. In one of her reflections, she wrote:

I am embracing my identity as ‘mother’ – not mother of [my kids] but universally, as a mother in this world. Someone to mentor, guide, support, love, and send others on their journeys forward with a little more confidence, motivation, [and] courage. (*Jill, reflection, Feb. 13, 2024*)

During one of our meetings, Jill wondered if her comfort with a mothering role was due to her identifying more strongly with education side of “engineering education” rather than engineering, which she believes to have more shared characteristics with motherhood such as nurturing, facilitating, and supporting.

In contrast, Stephanie only discussed motherhood in the context of having her own future children. She wanted to keep the role of “mother” solidly in her personal life. In June 2024, Stephanie attended two different engineering education conferences while visibly pregnant. She was frustrated by the conference experiences, and upon reflection, realized this was because she felt she was being primarily recognized as a future mother rather than as an academic who was presenting papers and co-chairing conference sessions. Informal conversations frequently turned to her pregnancy – both from her own excitement or the well-wishes of other academics who were mothers. In this way, it was difficult for her to foreground her scholarly identity and establish herself professionally within the national and international engineering education communities.

For Kari, her personal disinterest in both literal and figurative motherhood led her to reject this identity for herself and to guard against both its unwanted application by others in professional contexts, and implications that it is something she should want, or an integral aspect of her womanhood. Kari thus experienced what Faulkner (2009) describes as part of an in/visibility paradox: in addition to working to maintain an engineering identity in a male-dominated setting, she must also work to be recognized as a “real woman” without being pigeon-holed into stereotypically feminine identities, i.e., an identity as mother, that she does not want. Her difficulties reconciling this tension led to discomfort on Kari part during our discussions of motherhood, and her relative absence from them as reflected in our data.

Regardless of whether we wished to be identified as “mothers” in our professional setting, caring labor was essential to creating counterspaces for students who may not fit into traditional engineering identities. Jill discussed this as one of the most meaningful parts of her work:

It’s about making a little bit of space for people in this engineering and engineering education space. For ones that don’t feel like they fit traditionally in the space that’s there, which is narrow, I think. If we open up that space a little bit, and they find how they fit, and they become part of a community [...] they feel like what they’re doing and the path they’re walking on under this identity of engineering is meaningful. (*Jill, discussion, Feb. 13, 2024*)

She acknowledged that traditional engineering and engineering education identities and practices can be “narrow” and not accommodate different students, and wanted to widen or “open up the space” (i.e., create a counterspace) for those students to engage in personally meaningful ways. We wanted to support students who felt like they were on the fringes of engineering due to their interests, histories, and identities, such as Indigenous students whose professors had never voiced interest in learning about the impact of engineering in Indigenous communities. Just as our feminized professional networks supported our learning and growth as engineering education scholars, we wanted to create counterspaces to support our students in cultivating their sense of belonging in engineering education.

Creating space for students also required attention to their needs, which is another facet of care work. We each shared experiences where we helped students through emotional distress, such as this example:

Jill: ... As a teacher, I'm the one that will spend an hour in my office at 8am and chatting to someone about like, a family issue that has nothing to do [with my course]... but then, right, like there's more emotional investment as well. And I don't know if all people do that. And I wonder if that's a gender thing as well.

Kari: I think it's absolutely a gender thing. Yeah.

Jill: And it's good and powerful and empowering that [the faculty] has more women that they [the students] can see and then come to. But at the same token, then we're doing more again. (*discussion, Feb. 9, 2023*)

We explicitly connected students' willingness to come to us with our gender and our perceived otherness as engineering education faculty members. We valued being able to help our students deal with non-academic challenges in their lives. However, we also acknowledged that "we're doing more again", referring to the additional emotional labor involved in supporting students this way.

In another example, Jill reflected on her experience managing the logistics of an extended off-campus learning experience that required lodging and meals in addition to the course content. She and a woman colleague put significant work into ensuring that students were cared for. Jill acknowledged she did this because she is a woman and mother and felt it was important to ensure students' experiences of the whole course were positive, and their needs – physical, emotional, spiritual, as well as cognitive – were met. However, in our discussions, she also noted that she felt this care work was undervalued by (or invisible to) the administration in comparison to the more traditional and technical academic work done by, in this case, her male colleague. Thus, we experienced tension between care work being necessary for the creation of, and being valued within, those counterspaces, even while we worked within an institution that may not value or recognize such work.

WHEN COUNTERSPACES AREN'T ENOUGH – GENDERED VALUES IN INSTITUTIONAL PROCESSES

While our counterspaces provide us with personal and professional support, they do not mitigate the fact that we work and will be evaluated in an academic engineering setting with masculine norms. Our reflections and discussions revealed many instances in which the values that we perceived to be upheld in our professional context did not match our own values. These value tensions complicated our ability to move engineering education counterspaces towards the center of our faculty and institution. One tension that arose in our discussion was the valuing of competition over collaboration, as seen in the following excerpt from one of Stephanie's reflections:

The idea of a lone wolf rockstar academic has never resonated with me. I want to be someone who engages in collaborations in various roles, both as a leader and as a contributor. (*Stephanie, reflection, Feb. 6, 2024*)

This created friction within our own group as Jill had shared that she was deemed a "rockstar" by a supervisor and felt criticized for sharing and being perceived as wearing this mantle of masculinity among colleagues who wanted to reject that own identity for themselves. We also felt uncomfortable with how the masculine norm of competition devalued our collaborative work together, articulated by Jill:

Jill: I feel very constrained by the model in the University of the "co," the co-facilitator and the co-researcher and the co-supervisor. I feel really bothered by that. I feel bothered by the fact that there can be relationships that are equal, and they don't have to have a hierarchy in them. But the constant messaging is [about] the hierarchy. [...] You have to be clear about who is the top person and who is the bottom person and what you're doing that's different. And sometimes I feel like screaming because I think sometimes there is that, sometimes someone is doing more work, or someone

is leading something in a certain way. But many times, especially in the way we're all working, we're co-working to support each other. (*discussion, Feb. 6, 2024*)

We all engage in significant collaborations with colleagues across different facets of our work, including co-teaching courses, co-supervising graduate students, collaborating on research grants and projects, and co-writing manuscripts. Across several of our discussions, we collectively affirmed our belief that our work – teaching, research, and service – is stronger due to this collaboration. However, we lamented institutional practices such as collaborative grant funding letters being addressed solely to the PI (ignoring the work of collaborators) and needing to indicate who is the lead researcher on a project or primary advisor of a graduate student (even if that work is shared equally). These were regular reminders that our preferred ways of working within our counterspaces were not recognized within mainstream institutional processes.

We believe that tackling social justice issues is important in engineering education, even if there are many within engineering who believe that the discipline should be objective and neutral. Stephanie's passion for weaving social justice throughout her research, teaching, and service work was not tempered by the knowledge that some people in her academic community may not share the same values:

I'm fine with being known as a feminist or a "social justice warrior," knowing that many engineers may roll their eyes, because deep down I believe that these things are important – not just in engineering, but in the world at large. (*Stephanie, reflection, Feb 13, 2024*)

She used "social justice warrior," a derogatory term often used against women, people of color, 2SLGBTQ+ people, and others whose identities, attitudes, or work challenge dominant systems, to indicate that her social justice-focused engineering education work may be devalued or even ridiculed in her professional setting that prizes more technical engineering work. We are all deeply involved in social justice-focused engineering education initiatives, including efforts to decolonize and Indigenize engineering curriculum, a grassroots movement to rework the Canadian Ritual of the Calling of an Engineer to align with present-day values and ethical perspectives, and critical pedagogy. These movements and initiatives function as counterspaces within wider engineering culture. While we each find personal and professional meaning within interdisciplinary, social justice-focused work, we were keenly aware of differences between our work and that of our engineering colleagues:

I know that it's up to me to make an argument for my research and my career trajectory, and I'm not sure how hard I can or want to work to make an argument that's quite different from the ones that I anticipate most of my colleagues making. (*Kari, reflection, Feb. 6, 2024*)

Kari reflected on how making an argument for her research may lead to judgement, or questions related to "the overarching value of what I do or what we do" (*Kari, discussion, Feb. 6, 2024*) from her engineering colleagues. As engineering education researchers within an engineering faculty, we discussed the risk that the research topics, methodologies, and pedagogies in our engineering education work may be ignored or misunderstood (at best) or actively devalued and opposed (at worst) by engineering colleagues who will formally evaluate us for tenure and promotions. Our identities as women compounded this concern; the gendered nature of these value tensions (i.e., that values typically associated with masculinity are valued above those associated with femininity) reinforced the feelings of being an outsider that already exist for women in engineering. We deeply appreciated the support and recognition we have received within the counterspaces we have joined and built. However, we worried these counterspaces may not be enough in the face of institutional processes and norms with built in values that may devalue or oppose our work.

DISCUSSION

We present our discussion in three parts. First, we connect our findings with literature on gender, engineering/STEM, and higher education. Next, we discuss the value of counterspaces as a

theoretical movement within engineering education. Finally, we close with questions that can be considered by colleagues, administrators, leaders, and students to promote equity for engineering education scholars.

CONTRIBUTIONS TO LITERATURE ON GENDER, ENGINEERING, AND HIGHER EDUCATION

Our findings align with those of Belle et al., (2014) as our professional networks were mainly (but not entirely) made of other women. These networks themselves became counterspaces where we could resist the “chilly climate” (Hanson, 2020) of academic STEM. Our work also extends previous research by highlighting how scholars in emerging interdisciplinary fields may experience gendered value tensions. In our case, gendered disciplinary norms and histories of engineering, education, and the other fields in which we have been trained impact our ways of being and working within engineering education. Riley (2017) explained how “women do different kinds of boundary work from men in claiming engineering identities within the discipline” (p. 256) and how doing this boundary work led to colleagues questioning her loyalty to engineering. Further, Jesiek et al. (2009) have noted an “identity crisis” in that engineering education is not always sure how to situate itself with respect to other disciplines. As scholars and critics of interdisciplinarity have explained, boundaries between disciplines are in constant flux as they draw from and influence each other (Graff, 2016). Thus, there is complexity inherent in the ways that gendered disciplinary norms are asserted or challenged within engineering education, a field already negotiating identity and fighting for legitimacy (Seniuk Cicek et al., 2023), which has implications for scholars who work within it. Some people, especially women, may feel less pressure to exchange or mask their femininity in engineering education, as their gender identity does not render their career “inauthentic” in the way it may be in engineering (Faulkner, 2009). However, a mismatch between engineering education culture and the values within institutional processes (e.g., tenure and promotions) can lead to gatekeeping of professional opportunities and rewards for engineering education scholars. These barriers complicate the issue of legitimacy faced by new engineering education scholars previously discussed by Coso Strong et al. (2021).

Our findings reflect nuance in how the role of motherhood is desired and conferred upon women in engineering education. Each of us had different levels of identification with being a “mother” within our personal and/or professional lives. However, we all agreed that the care work required to support our students was one of the most rewarding aspects of our professional roles. Connections between care work and “mothering” raise several questions: as women, is it possible to care deeply about and mentor our students *without* having motherhood conferred upon us? And does intentionally taking on a “mothering” role influence how we and our work are perceived in our masculine professional context?

To be clear, we do not view the role of “mother” within academic contexts as one that is inherently negative. Some of us are comfortable with that role, or even strongly desire it. However, if colleagues and students *expect* that role, it takes away our agency to choose whether or how we take on that role. That expectation then influences how people view us and the work we can/should do to support our students. Fletcher (1999) has discussed how in many technical workplaces, relational work (such as mentoring, getting to know people personally, etc.) is devalued or even “disappeared” because it does not align with norms of effectiveness, such as individually solving technical problems (pp. 90–91). Yet at the same time, women in technical roles are *expected* to perform relational work and even penalized for not doing it, even as it comes at the expense of research and leadership opportunities that “count” towards tenure and promotions (Judson et al., 2019). Thus, understanding the nuanced connections between care work, motherhood, and disciplinary norms and practices is something that requires further attention in engineering education.

CONSIDERING COUNTERSPACES AS A THEORETICAL MOVEMENT IN ENGINEERING EDUCATION

Our work highlights the importance of both counterspaces *for* engineering education and counterspaces *in* engineering education. The types of counterspaces explored in our findings

align with those from Ong et al. (2018) for students of color in STEM, reframed with engineering education faculty members as the main participants. For us, the most powerful counterspaces were our peer and mentoring relationships within our feminized professional networks. These networks connected us to scholars with shared values, epistemologies, and research interests – something that is critically important for engineering education scholars who may alone or one of few in their institution. While they did not name it as a counterspace, the new engineering education scholars in Faber et al. (2016) noted how their weekly meetings became important sites of professional and personal support. Careful cultivation of this counterspace is necessary for us to survive and thrive.

We also recognized the value of EER conferences as counterspaces in which our work is valued. However, the discrepancy between how Jill's decolonizing and Indigenizing work was valued at conferences versus in an institutional engineering event showcases how these counterspaces may still exist at the margins. This can lead to challenges integrating counterspaces into engineering institutions (i.e., moving them towards the center), such as colleagues who have never heard of our association conferences, or questions about how EER conference papers or journal articles should be valued in relation to other engineering dissemination venues. We also note the importance of niches or counterspaces within engineering education conferences that push back even more strongly on masculine norms by explicitly valuing social justice work or research that is grounded in the humanities. Some conferences have formalized these counterspaces in the form of special interest groups or conference tracks. This raises questions: Does having a formal EDIA track push such work towards the center of engineering education, or move it to a different margin? Would it be better to integrate EDIA throughout the conference? How can we navigate integration without losing the aspects of the counterspace that made it powerful in the first place?

Our work extends previous research on counterspaces by articulating the caring labour required to create and maintain these counterspaces. Caring labour is necessary in vulnerable conversations with our peers as we build our networks of support. Caring labour also underlies our day-to-day mentorship of our students as they grow as engineers and engineering education scholars. While it is valuable to explore the types of counterspaces and their benefits for those marginalized in engineering or engineering education, future studies should also make visible the caring labour that enlivens these counterspaces. This is especially important in the absence of formal institutional support, as minoritized faculty members take on additional work to help themselves, their colleagues, and their students thrive. This caring labour should be formally recognized in institutional processes as service to the academic community.

Finally, Ong et al. (2018) discussed STEM departments being counterspaces for marginalized STEM students that move towards the center of academic institutions. Some strategies suggested for creating departments-as-counterspaces include informal gatherings for minoritized groups, having policies against racism and other discrimination, tone-setting by leadership, facilitating interdisciplinarity, and encouraging a collaborative department culture (Johnson et al., 2017; Ong et al., 2018). Our data was collected before our Centre's formal transition to a Department of Engineering Education. However, we saw glimpses of these strategies throughout our discussions and reflections. As we continue to push our engineering education counterspace towards the center of our academic institution, we must explicate the gendered norms that will continue to come into conflict. This will further our goal to promote an institutional culture that is inclusive of everyone, regardless of gender or other identity, in engineering and engineering education.

QUESTIONS TO PROMOTE ACTIONABLE CHANGE

While we work to center engineering education counterspaces in academic institutions, we must ensure these counterspaces remain supportive and meaningful for those who are minoritized in engineering education. This requires all of us – faculty members, administrators, leaders, staff, and students – to reflect on the ways that dominant norms are present in our institutions, professional associations, conferences, and conversations. We offer the following questions as a starting point for actionable change:

- How can we create academic spaces in which different epistemologies, methodologies, and ways of being are acknowledged and valued?
- How do we position and speak about our work in relation to others' work? What types of work receive public praise?
- How do we evaluate and reward work conducted in collaboration with others?
- How might institutional policies, such as those related to tenure and promotions, reify dominant norms that exclude or devalue work being conducted in the faculty?
- How can we make caring labor in engineering education visible? How can we acknowledge and reward it, without *expecting* it from people with certain identities?
- How do we determine what tracks, workshops, and keynotes to offer at our annual engineering education conferences? How can we continue to champion niches of support within these professional associations?

Answering these questions requires us to interrogate the gendered, racialized, and colonial history of our discipline. Our hope is that these interrogations will ultimately lead to engineering education communities that are more welcoming to all, especially minoritized groups. Further, these questions may also be helpful for reflection and social justice work in other STEM or STEM-adjacent fields.

CONCLUSION

In creating and maintaining counterspaces for and within engineering education, we must consider gendered norms within engineering education, engineering, and academia in general. A critical extension of this work will be to consider norms around race, class, and other marginalized identities in engineering education. Importantly, our work raises questions that can be used to interrogate and actively challenge such norms as we create counterspaces that move towards the center of academic institutions and communities. Responding to these questions is the collective responsibility of everyone in the engineering education ecosystem. We hope that our work inspires continued/new reflections, conversations, and actions around gender, equity, and counterspaces in engineering education.

DATA ACCESSIBILITY STATEMENT

The data used in this research project will not be made publicly available due to its personal nature.

ETHICS AND CONSENT

This research has been performed in accordance with the Declaration of Helsinki. In this collaborative ethnographic approach, all research participants are also co-authors on the paper. As per our institutional research ethics board guidelines at the time of conducting this research, this work did not require formal ethics review. We checked in with each other throughout the project to ensure we were treating each other and our data in an ethical and respectful way.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

All named authors made substantial contributions to the study conception and design, and the data collection, analysis, and interpretation. Stephanie led the writing, but all three authors critically revised the paper for important intellectual content. All authors provided final approval of the version to be published, agreed to be accountable for all aspects of the work, agreed to be named on the author list, and approved of the full author list.

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