frontiers | Frontiers in Communication

TYPE Original Research
PUBLISHED 07 March 2023
DOI 10.3389/fcomm.2023.1023594

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Science and Environmental Communication, a section of the journal Frontiers in Communication

RECEIVED 19 August 2022
ACCEPTED 27 January 2023
PUBLISHED 07 March 2023

CITATION
Miller CA, Castaneda DI and Alemán MW (2023) Pains and portends: A collaborative autoethnography of engineering faculty navigating gendered cultures. *Front. Commun.* 8:1023594. doi: 10.3389/fcomm.2023.1023594

Pains and portends: A collaborative autoethnography of engineering faculty navigating gendered cultures

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This mediated collaborative autoethnography uses reproduced dialogue, poetic inquiry, and composite, fictionalized narratives to story the gendered experiences of two instructional faculty teaching a coordinated engineering class and working in an undergraduate engineering program at a large public university. The contrasting, gendered narratives of the engineering faculty storied in this paper illuminate several themes: (1) discourses of gendered relational labor (masculinized savior vs. feminized emotional work); (2) gendered experiences of invisibility (not being heard or recognized for expertise) and hypervisibility (as a woman in engineering); and (3) the discounting and attempted diminishment of gendered issues in organizational settings. While self-reflexive and dialogic practices embodied in this autoethnography reveal the transformative possibility of accomplices in disrupting gendered relations of power and activating social change from within, those practices alone are insufficient to trouble the masculine culture of engineering. Authentic change demands that these practices be joined with structural, organizational changes in order to reconcile disparate, gendered experiences in engineering cultures, lest the exodus of women from masculine-dominant engineering fields persist unabated.

KEYWORDS

autoethnography, gender, engineering education, stem, reflexivity, dialogue, narrative

Introduction

The outbreak of the COVID-19 pandemic within the United States (US) in March 2020 laid bare and exacerbated systemic inequities entrenched in the nation, including gendered challenges in the workforce (Del Boca et al., 2020; Yavorsky et al., 2021). In higher education, nearly all institutions in the US pivoted suddenly to emergency remote teaching (ERT) (Bond et al., 2021). Faculty faced a myriad of challenges that fueled exhaustion and disengagement (Chierichetti and Backer, 2021; Daumiller et al., 2021; Taylor and Frechette, 2022), leading to The Great Faculty Disengagement (McClure and Fryar, 2022). Further, female faculty faced acute work-life balance disruptions since any support mechanisms available before the pandemic (e.g., childcare) were lost, exacerbating already existing gender inequities (Flaherty, 2020; Johnston et al., 2020; Malisch et al., 2020; Kirk-Jenkins and Hughey, 2021; Kim and Patterson, 2022). While catalyzed by the heightened gender inequities of the pandemic, our story and the pains we write about predate this global crisis and also point to a gendered problem in engineering that has been much too slow to change.

Those gendered problems in engineering and STEM fields did not arise by happenstance. Frehill (2004) conducted archival research on engineering periodicals from the early twentieth century and found that many of them promoted the engineering profession as an occupational space for "proving manhood" (p. 392) with images of sports and the outdoors meant to attract young boys and discourage the participation of young girls. Other STEM fields (e.g., biology,

chemistry, and mathematics) were also couched as masculine spaces in the early twentieth century (Frehill, 2004); yet, those fields have made significant strides in increasing the number of women enrolled in their respective bachelor's degree programs, with women presently receiving 85% of health science degrees, 61% of life science undergraduate degrees, and 42% of math degrees as examples (Fry et al., 2021). Engineering and computer science, during that same time span, have stagnated their enrollment of women in bachelor's degree programs to ∼22 and 19%, respectively (Fry et al., 2021). These low numbers are attributable, in large part, to the masculine-centric culture in these professions that make women both hyper-visible as females and invisible as engineers (Faulkner, 2009b; Akpanudo et al., 2017).

Masculine social norms and values in engineering are exclusionary to many women (and some men) in many ways, including subtle forms of institutionalized favoritism and/or barriers (Roos and Gatta, 2009), gender stereotyping that moves women and men with family responsibilities out of the academy (Williams et al., 2006), poorer job outcomes for those reporting sexual harassment and gender discrimination (Settles et al., 2006), engineering humor that tends toward sexism (Collinson, 1988; Schnurr and Holmes, 2009; Camacho and Lord, 2011), and hyper competitiveness (Secules, 2019). Additionally, masculine cultures result in the exertion of dominance over others, the objectivation of research and ideas, and deference to authority structures (Sørensen, 1992; Tonso, 2006) and symbols of power (Faulkner, 2000). This work-intensive and male-oriented culture leads to an exodus of women from engineering programs (Thébaud and Taylor, 2021; National Science Foundation and National Center for Science and Engineering Statistics, 2023). While women enrolling in undergraduate engineering programs are as academically prepared as their male peers, many women will encounter increasing self-doubt over the course of their programs. This deterioration in confidence is attributable to the masculine culture of engineering, as well as consciousness of sexism and negative attitudes of women in engineering, which is perpetuated by peers and faculty within engineering (McIlwee and Robinson, 1992; de Pillis and de Pillis, 2008; Caderet et al., 2017; Ong et al., 2018).

We witnessed firsthand these challenges before, during, and after the pandemic from our vantage point as engineering faculty at a primarily undergraduate institution (PUI) in the Mid-Atlantic region of the United States. During this time, we saw colleagues at our university and in our professional networks struggle to cope with competing demands at home and at work (Miller et al., 2022), which ultimately brought focused attention to the gendered inequities and routine microaggressions women in engineering routinely confront. Our experiences teaching engineering offer a microcosm of many of the gendered realities experienced by others across our STEM disciplinary cultures. The following paper specifically explores the gendered experiences of Callie and Daniel, two assistant professors of engineering, in collaboration with Melissa, a professor of communication studies who studies engineering cultures.

Callie: My world changed when COVID-19 hit. All the care I had for my students shifted to caring for my own anxieties about the future, my kids, and the cancer treatments that my parents needed. I had to shift into survival mode. I think it's been survival for me ever since. And... it's been exhausting.

Daniel: Nobody was prepared for ERT in Spring 2020, but I also saw you and other women really struggling with managing their classes in ways I didn't see happening with the men who are parents. I mean, I saw many of y'all actively tending to your kids—your very young kids!—in the middle of online meetings and online classes. It got worse in Fall 2020, too, when we pretended that we were "back to normal" in an online format. It was ridiculous—everyone's burden was way too high! Everyone I talked to was burning out. I would help others whenever I could, in my own ways, but I felt like I was constantly second-guessing myself on whether I was falling into the "knight-in-shining-armor" script, especially with female colleagues. Truthfully, I needed help, too.

Callie: Nobody was coming to help us. We were on our own, each of us. We did end up forming a small community of faculty, though, to protect ourselves from what seemed like an uncaring institution (Miller et al., 2022).

Daniel: When we were each assigned to teach multiple sections of the same engineering class in Spring 2021, I thought to myself, "I need to do something. I can't just stand by and be complicit in what's happening to you. I need to help." I know that I hear my "knight in shining armor voice" here—I'm realizing how deep seated it is!

Callie: Still, I was so relieved when you broached the idea of team teaching—nobody had done that for this class before.

Daniel: My thought was to approach this class with the objective of keeping the two of us okay—focus on the instructors and trust that the students will take care of themselves. The priority was no longer the course nor students, but *us*.

Callie: Not only was team teaching going to alleviate my prep, but when I've taught this class in the past, a lot of the students pushed back against my style, and it left me internalizing that I was somehow "not good enough" or didn't command an expert understanding of the content. Since we were going to be collaborating and highly coordinating this class together, I figured all these issues would go away... *but they didn't.* At the end of Spring 2021, the students still found reasons to say I wasn't doing a good job, even though I was using your content!

Daniel: I knew the gendered dynamics in engineering were real, but I hadn't explored what those gendered experiences acutely felt like for you, Callie. Since we're both considered underrepresented minorities in engineering, I figured our experiences would be comparable. That your experience as a woman in engineering would be similar to my own experiences as a Latino in engineering. I had developed my own coping mechanisms; I figured you had, too.

Callie: I think my coping mechanism had been to always assume I was doing something wrong—societal conditioning—but not actually interrogating that thought. Once we started collaborating, I started noticing that you weren't getting the same sorts of student questions or comparable volume of emailed requests and complaints from students. The more we talked about it, the

more we started noticing the differences in how we were treated.

Daniel: Then you started posing research questions about how to measure our differing experiences and started thinking about how to quantify the number of instances or number of entitled emails.

Callie: Really, I just wanted to make sense of our observations. Initially, my hope was just to figure out what I could do differently as a teacher. I've been conditioned to adapt or understand what *I'm* doing 'wrong' in the classroom vs. realizing that I'm being treated a certain way by my students and that there's nothing wrong with me! That's when we reached out to you, Melissa, to try to validate and make sense of our experience.

Melissa: And my first reaction when the three of us got together and started talking, "There's nothing wrong with you and how you teach, Callie! It's the engineering culture that has the problem and I have seen it in my interactions with students in your department, particularly women students." I remember one student complaining to me that she felt like she had to walk through a "man cave" every time she wanted to use the laser cutter for her projects, and she'd hurry through the space to get to it or sometimes avoid the room altogether. Like, she wasn't welcome there despite feeling a sense of competence on the machine.

Callie: I can't even begin to tell you what a relief it was to meet with you, hear your enthusiasm at partnering with us, AND to hear that you too were seeing gendered experiences and biases in your own observations.

Melissa: Having spent the past 7 years studying learning cultures in engineering, I had an outsider's glimpse into the overt and covert sexism that women faculty and students faced (Tomko et al., 2021), but this project felt different to me, as your collaboration was an intentional intervention to confront inequity. One of the things that was so striking to me in our early conversations was how vulnerable and open you both were. It was exciting to map out a plan that combined interactive interviewing and mediated co-constructive narratives to use autoethnography to make sense of your experiences and eventually craft narratives that reveal them (e.g., Ellis, 2004).

As Callie and Daniel began to interrogate their gendered experiences in teaching a coordinated engineering class in Spring 2021, we immediately recognized our particular social locations at a predominantly White institution (PWI) and the privileges afforded therein. Indeed, there is no singular gendered experience of engineering and the stories articulated in this paper are situated within our own social locations. Yet, gendered discrimination is experienced at the intersections of other forms of oppression such as racism (McGee and Martin, 2011; Ong et al., 2018; True-Funk et al., 2021; Holly and Quigley, 2022), xenophobia (Hale et al., 2011; Obiakor and Algozzine, 2022), and homophobia (Cech and Rothwell, 2018). As we approached this project, we faced the challenge of narrating our experiences in a predominantly White engineering department, rendering it difficult to illuminate the intersecting forms of oppression experienced without revealing (or implicating) our colleagues' identities, particularly those who occupy "only" statuses in the department. In short, we could only write from and story our own experiences. We recognize that people from other minoritized groups may read and find resonance with this work, while others will not see themselves reflected in our fictionalized stories. Nevertheless, it is vital that research on experiences in engineering education reflect a diversity of perspectives and describe the multiplicity of intersecting forms of oppression (e.g., gendered racism), rather than essentializing the experiences of women. We feel compelled to share our experiences such that we can illustrate the "pains" from our own vantage point in encountering, resisting, and challenging the masculine norms of engineering culture in higher education that has undoubtedly been met as a challenge by many others. In our own inquiry, we start by interrogating our own positionality as an essential first step.

Melissa: I grew up in a White, middle-class academic family and lived in a diverse, working-class neighborhood adjacent to the community college where both my parents were professors.

Callie: Me too, I'm the oldest of two girls in a White, middle-class academic family.

Daniel: And I'm the oldest in my family, too. My parents are immigrants from Mexico and El Salvador which made me a First Generation Everything: first to be a US Citizen, first to finish high school, first to go to college and earn my BS, MS, and PhD degrees, and so on and so forth. I had to navigate a lot of that on my own, which is a common experience for minority students (e.g., Chang et al., 2014).

Melissa: I am married to a Latino, first generation professor and our comparative professional experiences at our PWI situate my White, classed privilege in stark contrast to the racial microaggressions he faces routinely on our campus (Alemán, 2020). While my identity growing up was deeply shaped by dinner table conversations in which my parents often talked about work, most memorably my mom's experiences confronting sexism and the disparities between her and my father's experiences. In many ways, she presented a feminist roadmap for me, one that also simultaneously created a shield for my white privilege, that later became the topics of our family's dinner table conversations with our son.

Daniel: It was a bit different for me. My father worked many jobs to support the family, and my mother worked with what little she had to raise us right. They both valued education, so that was my only job growing up: to do well in school and secure a better future for myself (e.g., Hernandez et al., 2016; Pew Research Center, 2016). I went through a K-12 system that was highly diverse, so I did not necessarily see myself as a minority there; I saw myself as a person in a diverse community. I do remember in 2nd Grade or so the teacher handing out candy to White students and not handing out candy to non-White students as part of a lesson—I forget what exactly the lesson was about. It imprinted onto me, though, that others viewed me differently, and I had no control over it (e.g., Dulin-Keita et al., 2011). When I started college (and later graduate school) studying civil engineering, I learned

that I was a minority—an underrepresented minority (URM) in engineering—because I am Hispanic/Latino. I had never internalized that before—that I was a rarity in engineering, I guess—and I had to figure out what the "URM" label meant for me—which I later learned is a problematic term (e.g., Allen et al., 2019; Bhatti, 2021).

Callie: For me, I just knew that I loved learning and seemed to have an affinity for math and science. I chose math as a major in college because of amazing faculty, not realizing how rare it was to have so many strong female math professors until I hit graduate school. Once I got to graduate school, I quickly found no women role models, and although I started the math PhD program with five other women, after the first year, only three were left, and ultimately only one made it through to earn her PhD in math whereas I was the only other PhD after I made the switch to bioengineering.

Daniel: As I went through college and graduate school, I came to learn that people with that URM label historically leave STEM due to a variety of factors (e.g., Estrada et al., 2016). Knowing that really informed my ambition to pursue an engineering faculty position and help "those behind me" to see someone like them who had "made it to the end"—to emerge as a role model for others (e.g., Carlone and Johnson, 2007; Chang et al., 2011; Espinosa, 2011).

Callie: Similar to you, Daniel, I wanted to become a professor to encourage other women to persist in STEM, and mentor them through the possibilities that a degree in STEM could afford them after college. I also felt it was critical to show what having a family and a STEM career could look like. Raise awareness of the "lean in" moments: who you need to ask for help from in your community, how to build that community, how to put your oxygen mask on first, and challenge the social norms of what it means to be a woman in the US, and a woman in STEM.

Melissa: Although I am an outsider to engineering as a tenured professor of Communication Studies, I have spent the past decade working on university service related to tackling intersectional forms of oppression in STEM specifically and working on grant-supported, qualitative research that studies learning in engineering makerspaces. These standpoints provided me with an insider-outsider status that gave me enough knowledge to talk about engineering cultures, and it also enabled me to trouble and ask questions about tacit assumptions as they arose in our work.

Daniel: I was glad to have your input, Melissa, since taking on the mantle of supporting minoritized students as a role model is weighty. Although I have my own lived experience, I don't always have the answer for everything when it feels like I should, so better understanding Callie's and my experience can only help us to better serve our students.

Our process: Collaborative autoethnography

Autoethnography is a qualitative, writing-based method of inquiry that draws upon a researcher's everyday lived experiences to generate knowledge about social and cultural phenomena, combining autobiographical forms of personal narrative with the research practices of ethnography (Ellis, 2004; Ellis et al., 2011). Collaborative autoethnography involves the engagement of multiple researchers who share a common experience or social location, who explore, interrogate, and ultimately lend understanding to that shared experience (Chang et al., 2014). Collaborative autoethnography offers an opportunity to understand an experience from multiple viewpoints and perspectives, thus demonstrating that there is not a "single story" to a given experience. Multiple perspectives are particularly important in studying the experiences within a disciplinary community entrenched in ideals of White masculinity—"think engineer, think White man"—that lingers in student, faculty, and professional imaginaries, serving to reproduce inequity in everyday interactions (Bix, 2004; Hewlett et al., 2008; Adams, 2019; Eastman et al., 2019). Collaborative autoethnographic methodologies allow us to look closely at those everyday practices from multiple viewpoints, and, through writing such stories, illuminate the power relations of the larger social system.

We used processes of mediated autoethnography, through combining processes from Ellis (2004) methodologies of interactive interviewing and mediated co-constructed narratives. As an outsider familiar with engineering cultures and "mediator" of the processes, Melissa employed facilitative processes that encouraged reflection and self-reflexivity, storytelling, and both analytic closeness and distance. Specifically, over the course of an academic year, Callie and Daniel engaged in weekly processes of reflective journaling about experiences inside and outside of the engineering classrooms, which was followed by scaffolded recorded conversations about their experiences during that time, and written and oral storytelling. The initial reflective journals about teaching experiences in engineering served as the catalyst materials from which Melissa created a set of questions that guided the initial series of recorded conversations. We recorded these conversations on Zoom and created a live transcript of each recording that we each independently reviewed in-between meetings. Future meetings took the form of interactive interviews in which each of us asked questions of one another about experiences, feelings, and interpretations offered in the previous meeting. These interactive interviews were also recorded and transcribed *via* Zoom. The interactive interviews were characterized by open storytelling, questioning, clarifying, exploring, and interpreting. While relatively unstructured in form, we began to see themes emerging in these weekly interviews that would later become the basis of the stories that follow.

As a writing-based form of inquiry, we each began to write initial narratives that were drawn upon the transcribed texts of the interviews, written reflections that identified salient meanings that emerged from close readings of those transcripts, and meetings in which we collaboratively identified key moments, emotions, and relationships that conveyed gendered relations of power. In doing so, we used multiple forms of writing to tap into the experiences revealed in the interviews. First, we constructed composite, fictionalized narratives to show everyday gendered inequities, divisions of labor, and gendered forms of interactions. As untenured faculty in engineering, the pre-carity of telling disciplinary stories of inequity is not without risk, even in this fictionalized form. Yet, the essential truths of the fictionalized narratives are drawn from our own experiences and those we have witnessed within our professional spheres. Creating a composite, fictionalized narrative

involves drawing from the reservoir of journals and interviews to combine aspects of different characters, interactions, and experiences into a single unfolding drama. For example, a single character in a story may be created from the attributes and interactions with multiple people, making it impossible to discern an identifiable individual who exists in the community. Composite narratives also draw from multiple experiences, messages, and contexts that emerge over the course of an autoethnographic project to create an entirely new story that still expresses the truths, emotions, and experiential realities of the participants and storytellers, going beyond merely offering pseudonyms for the individuals in a community, to include greater protection of the narrators as well (Caine et al., 2017).

Second, to condense the repetitive experiences of disconfirmation and self-doubt, we used poetic inquiry to illuminate subjective experiences of gendered encounters with others. We chose to write in the form of what Richardson (1997) calls narrative poetry as it unfolds an experience of the researcher (or of participants) in a condensed form. In many ways, these are similar to research poems or poetic transcriptions (Glesne, 1997), as significant features of the poetic interludes are drawn directly from the words recorded in our interactive interviews, combined with experiences witnessed time and again both in broader engineering spheres and through reading the literature. *Yet, as authors we are both the subjects and the creators of those poems.* Finally, we reconstructed dialogues between the three authors from hours of interactive interviews. These reconstructed dialogues illustrate how we worked collaboratively to make sense of the gendered dynamics in engineering cultures. Similar to Allen et al. (1999) germinal essay on dis/enchantment in the academy, "we [too] advocate for dialogue as an important impetus for self-discovery, healing, and transformation" (p. 404).

As you read through our reconstructed dialogue, fictionalized stories, and poetic interludes, we invite you to listen for the themes of (1) discourses of gendered relational labor (masculinized savior vs. feminized emotional work); (2) gendered experiences of invisibility (not being heard or recognized for expertise) and hypervisibility (as a woman in engineering); and (3) the discounting and attempted diminishment of gendered issues as they are interwoven throughout.

It is important to reiterate the stories that follow are composite narratives and that they reflect no singular experience nor person(s). This form of fictionalization is essential to protecting both ourselves and others from potential harm—relational or material (Ellis, 2007).

Don't drop out now!

There's high tension in my shoulders and a vice of pressure on my temples. The demands of this semester are taking their physical toll on me. This is my third year of my tenure track job in an engineering department with very few women faculty, most without tenure. We teach a predominantly White male student population, and my women colleagues and I often find ourselves leaning against office doorways recounting our struggles in the classroom with one another. It's like a form of camaraderie—born out of survival—needed to slog through the muck of biting and diminishing commentary from mostly male students that builds up over time and would take hold if not for the support of others to just push through.

Leading my research team is one of the highlights of my job though. It's Thursday, and I follow my team into the lab for our weekly meeting. All the rooms in the engineering hallways are surrounded by large glass windows and doors—a fishbowl—you can see into and across different workspaces. It does create a sense of community, as everyone can see everyone else as they're working. The students cheerfully chat away, piling their voices on top of one another in a messy cacophony I've come to love, their words the melody to the rhythm of laptops clicking against the tables as each of us claims our seats at the circular table. I can tell there's been good progress since last week; their eyes are looking up rather than buried in their phones. Before I've even said all my "good mornings," there's a tingle in my pocket. My phone starts vibrating. Bzzz.BzzzBzzz I can't ignore it. Bzzz.BzzzBzzz What if it's about the kids at home? Bzzz.BzzzBzzz I look down at my phone to an emergency message from my colleague, Johnny. "911. Arielle needs to see you." *Sigh*.

A tenured professor, Johnny Jackson conveys an even demeanor, crisp as his pressed pants and always tidy button-down shirt; he never seems to be ruffled by much of anything. My heart now picks up its pace as nothing rings emergency alarms for Johnny. I push back my chair, leaning heavily on the arms to push myself up, already walking to the door I turn my head and instruct, "Go ahead and get started without me. I've got to attend to something pressing."

I hope Arielle is OK. She participated in my first-year engineering class last year and did really well. Now, in her second year, she's in Johnny's vector mechanics class. I find her leaning against the wall just outside Johnny's office door, eyes averted to the floor, a black beanie cap stretched down to conceal her eyebrows, long curly hair hiding her slumped shoulders. I look into Johnny's office, and I see him at his desk looking at his computer while finishing up an email. Johnny looks up at me with raised eyebrows. His eyes then point to Arielle, and he shrugs his shoulders. Arielle looks my way, barely making eye contact, and acknowledges me.

"Hey, Dr. Showalter," Johnny breaks the awkward silence, no apologies for interrupting my team meeting. Very formally, he continues as if a principal talking to one of his high school teachers, "Thanks for coming. Arielle and I have been chatting for a bit, and she is having some trouble in my class. She's a hard worker but is struggling with some of the recent topics. She mentioned a few things to me that I think would be better if she could talk with you. To get a better handle on the major."

Wait, what? How is this a 911 emergency? Arielle is in your class, Johnny, not mine—this isn't an emergency at all! He's done this before, too—handing a student off to me to solve their problem.

I can feel the tension in my shoulders tighten and a wave of hot blood rushes over my face. I'm seething, but I can't make sense of it. Brows furrowed with concern, my face masks my frustration with Johnny. He just wants what's best for Arielle, right? And maybe I really can help her get a better handle on the major… Right? I count to three in my head to calm my breathing. Feeling trapped, I motion for Arielle to follow me to my office. "Let's head down to my office and see if we can figure things out." She lets out a loud sigh as if she was holding her breath and follows me down the hall. "Thanks!" Johnny calls out as Arielle and I walk to my office. He shuts his office door, likely to prevent any further distractions.

I walk behind my desk, my own emails piling up, the research meeting abandoned yet again. Last week, I canceled it because my kid got sick. This week, yet another engineering student in crisis. I gesture

for Arielle to sit down across from me. She plops herself down on the chair and drops her backpack on the floor beside her. Tears start streaming down her face. I pass her a box of tissues from my desk. *Is this why Johnny passed her off? Because she's crying?*

Finally, she looks up. "I know I'm failing Dr. Jackson's class. A big part of the class grade is the group project and," she gulps between sobs, "I'm not getting along with everyone. I try to delegate, but get ignored and—I don't know... maybe I'm not cut out for engineering."

Failing Johnny's class? Not cut out for engineering? Ugh, Arielle! There are so few women in engineering! Don't drop out now! I don't want to see yet another woman leave the program. "Of course you can do this, Arielle," I respond calmly and assuredly, leaning toward her to catch her eyes with mine. "I think you deserve to be here, and I think you can do this."

Just yesterday

Just yesterday,
a student slinked out of class.
Peers assumed she would drop out.
"Students these days don't work as hard as they used to,"
The tenured professor bemoans,
leader for over 10 years.
Can I dare imagine a scenario in which *he* reaches out to *her*?
Just yesterday. Just last week. Just last month.
Left to pick up shattered pieces,
the goals of young women, nascent engineers,
to piece together hope that they can persist,
confronted with implicit messages that everyone must work harder, longer,
to prove they belong.
Again. And again.
Why I struggle, to this day, with trusting myself,
The work I put in,
The accolades I've earned.
An inner voice telling me I haven't worked hard enough to prove
I know what I'm talking about.
Doubt engrained
as a college student,
and graduate student,
and postdoc,
and now as a faculty member.
Always having to prove that I belong, too (e.g., Adams, 2019).
Overpreparing.
Setting healthy boundaries and modeling for students.
Witness to dysfunctional student teams and those that demean them.
They are stuck. Am I?
I validate them,
their experiences,
as "real," not imagined.
I see them. Understand.
Does it get better? I sure hope so.
Sometimes,
I want to advise them
stay far away from engineering.
I worry that they, too,
won't see themselves reflected in workplace ideals,
won't be taken seriously.
will be told by team members
just be the "documentation girl" (Tomko et al., 2021).

> *In moments like this, seeing Arielle tearful and unnerved about staying in engineering, I remember that I consider it my job to keep her—and others like her—in the major. To find pathways for her success. Offer support and validation for her experiences. It's Johnny's, and my other male colleague's job, too. Why couldn't Johnny have this conversation with Arielle? She doesn't simply need another woman to affirm that she belongs.*

Before I can speak, Arielle continues, looking at me hopefully: "I've been thinking about what might help me," she starts, "and Dr. Jackson mentioned that you teach the same class every other year? I was just wondering if we could set up a weekly time to meet? Like, I was thinking that we could meet every week and you could go over each homework with me. I think if we could do that then I can bump up my part of the class grade that I can control, leave the team grade to just be what it is, and I might be able to get through it?"

Oh, no. Arielle wants a tutor for this class. And the tutor she wants is me. If I say no, then the program will lose her. If I say yes, that'll be less time for me to keep my research going, let alone prep my own class materials. I don't have tenure yet. I just walked away from my research team to meet with Arielle, though. *"When it should have been Johnny having this conversation," I think to myself.*

Gendered labor in STEM education

There are various forms of gendered organizational labor that persist in STEM education cultures generally, and engineering education specifically, that minoritized students and faculty employ to survive and persist. Educational cultures in which its members draw upon sexist and racist stereotypes and communicate microaggressions undermine minoritized students and faculty, creating a cultural and identity tax that faculty of color and White women pay in the form of invisible labor (Padilla, 1994; Social Sciences Feminist Network Research Group, 2017). Invisible labor through cultural and identity taxation and gendered assumptions about responsibilities for caregiving mean that faculty of color and White women are engaging in greater levels of care work in the form of mentoring students and junior colleagues who share their identities, participating in identity-related service loads to ensure representation on committees, labor that detracts from valued and rewarded accomplishments in the academy, such as the production of publications and grants (Turner, 2002; Guarino and Borden, 2017). "Emotional and cognitive forms of labor are more than just managing strong feelings or grappling with complex thoughts; they are additional work required of students of color and White women to navigate spaces infused with gendered and racialized logics about ability and belonging" (Battey et al., 2022, p. 95).

Emotional labor is specific to a work situation where employees or workers manage their own feelings to conform with the implicitly (or explicitly) defined rules (Wharton, 2009).

Specifically in academia, untenured faculty and discipline-specific underrepresented faculty (e.g., men in a nursing program), have emotional labor that looks like "service with authority" (Tunguz, 2014, p.4). What this "service with authority" and emotional labor can look like for female faculty in STEM is the management of emotional responses to requests for more special favors, an expectation of being a "friend," more demands for serving on committees, or doing additional (undervalued) work—in short, the performance of feminine emotional expressions associated with caregiving and nurturing (e.g., Dryburgh, 1999). Academically entitled students, in particular, are more likely to make requests of female faculty and then consequently react in negative behavioral ways if the requests are denied (El-Alayli et al., 2018).

One primary tactic to plug the leaks of women leaving the STEM pipeline involves increasing female mentorship from peers to professors (Dennehy and Dasgupta, 2017; Hernandez et al., 2020). This approach is grounded in the assumption that a female student able to "see" themselves represented in a professor is more likely to feel they "fit" in engineering culture. However, this solution places an extra, invisible service burden on female faculty. In our first fictionalized story, Johnny identified Sally as a successful woman in engineering who could serve as Arielle's mentor and role model. Yet, Johnny did not necessarily consider the primary roles expected of a faculty member that Sally juggles—the same as his. Sally rationalizes Johnny's positive intent for Arielle, yet finds herself being asked, yet again, to mentor women engineering students who have very few women engineering faculty role models. This extra, invisible service detracts from Sally's large volume of commitments and adds to her emotional labor of care for students (see Hasano et al., 2019).

Even with the efforts to stop the leaky STEM pipeline, the persistence of women in engineering is particularly dismal, attributed to not only the societal expectations of gendered labor at home, but the masculine engineering culture which is arguably more apparent in engineering than other sciences (Robinson and McIlwee, 1991; Hewlett et al., 2008; Roy, 2019). Knowing that gender representation in engineering is especially important means Sally feels strongly that she must do everything in her power to keep Arielle feeling like she belongs in the engineering program. Sentiments of women persisting in the masculine cultures of engineering and academia extend beyond simply student-faculty relationships or student-student relationships; they include faculty-faculty relationships, too.

From the classroom to the conference room

Julia Jones, an untenured faculty member, is slated to present her findings at the Faculty Advisory Committee meeting. Students struggle to meet the standards of learning required of them in the engineering program creating a retention issue. The department head tasked the committee to explore the program's student recruitment and retention efforts, and appointed a diverse group of faculty, holding a wide range of opinions on the matter. I'm here, as is Cathy, a tenured female colleague. Johnny's here, too, as are Bobby and Victor. Bobby's untenured, like me. We started here at nearly the same time. Victor's been here nearly 10 years. Tenured and often vocal when the status quo is threatened.

The committee chair walks in a few minutes late and takes his seat near the front of the conference room. Julia readies her notes at the lectern. The projector flickers as it powers up. Johnny looks distracted, he has his laptop open and is checking his email. Bobby is chatting with Cathy about something, and I see Victor shuffling through his notebook. I offer an encouraging smile to Julia. She's clearly nervous, shuffling her notes and waiting for a cue that she holds the floor. In preparation for the meeting, Cathy and I met with her for about an hour to go over her data, offer suggestions for how to respond to faculty who may try to derail the conversation, and shared our own stories that we hear from female students about a variety of challenges with our program that are mirrored by her data. Mostly though, our pre-meeting offered encouragement that she's a competent, knowledgeable person, and to acknowledge that push back from faculty members is just part of the game, not a reflection of her capabilities. Goodness knows I've felt deflated after plenty of faculty meetings where colleagues pushed back on new ideas or approaches to engineering education.

"So, Julia," the committee chair starts, "Ready to show us what you found?" Julia nods and starts her presentation. In her effort, Julia gained key insights regarding what the students are experiencing. I know she was able to access databases at the registrar's office, so she can buttress her findings with statistical significance.

She gets about halfway through her slides when the first interruption stops her mid-sentence. "So, Julia, you're saying that our students are dropping the engineering major because they can't make it out of the math courses?" Bobby asks.

"Right," Julia confirms, "and it's particularly in Calculus II where we see a lot of students repeat three times before deciding to leave the major."

Johnny adds, "We've known this for a long time, Bobby. The first 2 years of the engineering program have always had trouble with retention because of math and physics. The students struggle with those courses. It's not our courses that they struggle with."

Past conversations with Arielle and other women in our program flood through my mind as Johnny says this. "Well, that's not entirely true," I chime in, "We've had a lot of female students struggle in our engineering classes. There's a retention issue there, too."

There are murmurs in the small room, and it is not entirely quiet as Julia advances to the next slide to confirm my assertion: the male-female representation shifts in the program. A greater number of women leave the engineering major after the second year, *after* the challenges with Calc II. The facts are staring everyone in the face with the chart displayed on the screen.

"See? Getting our students through the math sequence is one big issue, but we've got to be able to get them through our engineering courses, too." I add. "I can't tell you how many meetings I have with female students talking about poor, disrespectful male behavior on teams, or blatant sexism from faculty and students. This culture we have in our program of overworking yourself to prove you belong is shutting women out."

"You know," Victor starts in a huff, pointing to the chart, "we lose *male* students, too, after the second year, so it's not like women alone are leaving the major. There could be other factors at play here, like, where they are from, what their math preparedness is from K-12. None of these issues are our problem to solve."

My jaw visibly drops, looking around the room to check my colleagues' expressions. Did he really just say that? While I recognize there are multiple factors at play, there's still a gender pattern that's

right there, documented, staring us in the face! I've heard countless stories, even earlier this week, that point to gender discrimination, often discredited as anecdotal. Why can't we have a larger discussion about the challenges of creating a culture inclusive to all genders? He's so quick to dismiss gender as one of the root challenges we have. This is ridiculous.

"That could be true," Julia adds. I hear a quiver in her voice—anger or nerves? This kind of challenge that Victor has laid down is exactly what she was anticipating and what we, she, Cathy, and I, prepared for earlier. *Slogging through the muck.* I know she's prepared to refute his claims, but it doesn't change how it must feel for her right now in this moment. To be challenged, yet again, on your expertise. I've felt this way multiple times; it's like, whatever I say is never correct enough, or my expertise isn't good enough... "However," Julia resumes, "I started looking at that issue and the data shows..."

The committee chair interrupts, "It might be that we lose some men and some women after the second year, Victor, but those numbers are small compared to the high number of students we lose in the first year of our program in the math sequence. We really need to focus on retention in the first year since that's part of the messaging from the administration right now."

Bobby adds, "I don't think we should overlook the gendered issue, though. Sally does get treated differently than me in the class we teach."

The committee chair stops and turns his head, "What do you mean, Bobby?" he asks.

"Well," Bobby starts, "Sally definitely gets more entitled emails from students and has had more instances of students demanding things of her."

Thank you, Bobby! He's always been curious when he asks me about how it's going in the classroom and my rapport with students. He's been an ally for me, for sure. I'm still a bit shocked from Victor's earlier comment, though. My inner outrage is blocking me from forming a coherent counterpoint that is different from what Julia has already shown us. *I mean, what can I say to convince Victor when the data right in front of him isn't enough?*

"I get emails from students, too," Victor opines, "And it's not because I'm a man or woman. It's because, you know, I'm their professor." He chuckles and looks around the room to encourage others to laugh. A few join him in dismissive laughter. I shake my head. He's so misguided, how are other faculty allowing him to shoot off about this?

"I think the point that Bobby and Sally are trying to make, and what is shown in this data," Julia advances to a slide on a mindset study she ran on the entire student cohort, "is that engineering students hold very traditional viewpoints on gender roles."

"Right," I add, finally feeling like I've righted myself enough to weigh in. "I read about it in a journal paper where students come into the classroom and see me vs. Bobby and they come to have very different expectations of us, just because of our gender" (e.g., Eagly and Karau, 2002).

"Hold on. A question for you both," Victor asks, leaning forward as he traces his finger back and forth between Bobby and me, "Aren't there differences between you two that are more than just gender?"

Bobby and I look at each other, unsure of what to say. "Sure," Bobby concedes.

"Well," Victor replies as he leans back into his chair, pleased with his point, "then you can't say that gender is the issue. You're fundamentally two different people so of course you're going to be treated differently by students."

I feel frozen in time. At least my mouth wasn't gaping this time as everyone stares at Bobby and me. I don't know how to respond. His comment is so off-base, entitled, arrogant, and dismissive of my experience.

"You know," Cathy chimes in, thankfully. "You can't just dismiss the fact that gender plays a role. I can send you some research articles on it, Vic."

"Well," Victor starts. "I've read some of that stuff already. A lot of the work isn't verifiable. You can't control for any of that gender stuff." *Umm, yes you can* (e.g., El-Alayli et al., 2018)!

"We could run a study," I start, "to measure how many emails Cathy, Julia, and I get vs. you, Bobby, and Johnny." *I'm glad I'm finally saying this...*

"I like Sally's idea..." Bobby adds cautiously, "and I bet we can learn more about this issue as a department through that process," *Yes, Bobby! Yes, we can!* "We can even publish what we learn."

"Whoa, there," Victor interrupts. "That's a neat idea, and all, but that kind of stuff can't be published anywhere. You could run the study, and I guess it's good to know or be aware of, but you should focus your scholarship in a more tangible direction. You both do go up for tenure soon."

It dawns on me that Victor is badgering us, just like my students bully me in their emails. Asking me, telling me is more like it, what I should or should not do, and that my experience and expertise doesn't matter.

"I think we're getting off track," Johnny interjects.

"We are, indeed," the committee chair agrees. "Julia, can you please continue with your presentation?" I put my head in my hands and quietly listen to the rest of Julia's presentation. More questions are raised for Julia. More challenges are directed at Julia. Unclear paths are mentioned, and no clear next steps are listed. Julia finally finishes her presentation. I'm dejected. I stay quiet.

When the meeting adjourns, and people disperse out into the hallway from the conference room, the perfunctory meetings-after-the-meetings begin to form in different office spaces. I sulk into my office, where Cathy finds me. "You know," she starts to counsel, "I've been teaching here for a long time. When Victor says those things, he's just not ready to understand. But he's got to hear the information over and over again. Him, Johnny, Bobby, and everyone else... They'll get it eventually."

"Okay," I mutter weakly as she leaves my office. Cathy's comments leave me feeling deflated. *Keep repeating myself over and over again? Keep proving myself over and over again?* Can't this cycle end? If Cathy's put up with this for her entire career, then is that what's in store for me?

I decide to walk to the front office and find the department head so that I can convey to him how I feel about the power and gender dynamics in our program and department. "Hey," I start. "I appreciate that you tasked the Faculty Advisory Committee to investigate the retention issues in our program. Julia found data from the Registrar's office about how our male-female student demographics shift, and how we lose women at a disproportionate rate."

"Right, the gender problem in engineering has been obvious to me for quite some time," he says.

"These are important issues for the department," I argue. "But when Julia's presenting her findings, and Cathy and I share our experiences... I can... I just feel bullied and run over!"

"Did something happen that you need to report?" he asks me. I say no, unsure what I would report besides my feelings.

"Well," he shifts his weight in his chair and chooses his words carefully, "that's a troubling situation to hear about. I'm sorry that was your experience. I can relay this to the leadership in the college and university at our next executive meeting, but without anything specific to report, there is very little that I can do about it." *I'm disappointed, but what did I expect?*

"But if you have ideas on how we can make our program more welcoming for our students and faculty, then I'm all ears."

I'm dejected. I stay quiet. I don't even know where to start.

More than just a leaky pipeline

Engineering disciplines historically have been characterized by White heteronormative masculinity, a culture in which minoritized persons have faced numerous challenges in their educational and professional experiences (Bix, 2004; Adams, 2019; Eastman et al., 2019; Leung et al., 2020; Martin and Garza, 2020). Being the dominant culture, White men in engineering often do not see microaggressions, so there is very little reason to challenge the status quo (Lord et al., 2019; Cech, 2022). In the vignette above, Julia is repeatedly interrupted, calling into question her expertise and diminishing her role throughout the faculty meeting. Moreover, Cathy, Julia, and Sally anticipated (and actively experience) microaggressions in the form of dismissive and belittling questioning and comments on their experiences by Victor. His comments are quick to dismiss the experience women have faced in their faculty roles as either experiences that all faculty members face (e.g., student emails), or as not important for doing the professor job (e.g., research that would not "count" toward tenure). One of the critical points to the story is the idea that Cathy has routinely been in rooms or meetings where these types of comments are made over her career and has felt the need to dismiss or "just deal with it" to survive. Additionally, our story highlights the challenge of documenting these types of instances as they often fall short of reportable offenses to Human Resources.

While there has been a noticeable increase in minoritized individuals entering engineering fields, there remain both subtle and sometimes overt obstacles to success (Faulkner, 2009a,b; Camacho and Lord, 2011; Cech and Rothwell, 2018). For example, women undergraduate engineering students describe both benevolent and hostile sexism in their experiences in engineering making cultures (Tomko et al., 2021), while women faculty consistently experience exclusionary, harassing, and unequal treatment in relation to men in academic settings (Bronstein and Farnsworth, 1998; El-Alayli et al., 2018; Casad et al., 2021). Given this, it is not surprising that Fox (2010) found that women faculty gave "significantly lower rankings to aspects of their position/unit, signifying lower benefits of human and material resources in vital areas: access to equipment, sense of inclusion from faculty in the department, and recognition received from faculty for their accomplishments" (p. 1,007).

While most of the leaking STEM pipeline efforts are focused on increasing representation of women in K-12, undergrad, and graduate school, there continues to be "leaking" at the professional level. Women are two times as likely as men to voluntarily leave their tenure/tenure-track position for a different opportunity (August, 2006). Many women faculty leave tenure-track and tenured faculty positions for any number of reasons associated with lack of respect demonstrated by colleagues, limited opportunities for personal growth and promotion, lack of support for resources (including salary), assistance with providing care for dependents, or finding jobs for spouses, and a lack of fit with the institution's values and their research interests (August, 2006). The organizational climate of engineering is coupled with broader work-life integration in both STEM specifically, and higher education generally. Minoritized individuals in higher education are more often aware of inequality issues in the workplace since they have needed to navigate those exclusionary cultures for extensive periods of their lives, and they are able to see microaggressions in the workplace more readily. However, that does not mean that those same individuals are equipped to challenge microaggressions or inequitable climates single-handedly.

Am I part of the problem?

Man, that was an awful committee meeting! Vic wouldn't stop questioning Julia's data, and it didn't seem like any of the guys believed Sally and Cathy when they shared their experiences. Cathy's been here for longer than me. She's my mentor, and we're friends; but she never talks about these gendered issues with me. Sally does, though. *Is Sally just more sensitive about this than Cathy?* I've seen the emails she gets, though. I wonder, *does Cathy get the same kinds of entitled emails from our male students? The same type of entitled attitudes?*

I'm still unsure that it is as bad as Sally says it is for the women in our program. We're both on the tenure-track and came into the department at the same time and I've never had women students complain to me about facing gendered issues in the classroom—not one. I have a pretty good rapport with students, too, so I would've known about this, right? I mean, in my classes, I pay attention to them. I notice who's engaging and who's being left out. The students who are quick to shoot their hands up and are overly eager to answer my questions, I make sure to cool them down; so that others can join in. After about a week into every semester, I think everyone gets the message: "Everyone participates equally." I memorize their names and I call on them to answer. I make sure to call on everyone so that I'm being inclusive of everyone in the classroom. *Huh, I tend to memorize the women's names more easily since there's always fewer of them in my engineering classes.* I can't do much to change those demographics, though; that's just the way it pans out nationwide. There are simply more men in engineering fields than women, and all I can do is make sure to foster an inclusive environment in my classroom. So that the female and minoritized students have someone they can confide in—me—when they're having problems. *I'm starting to second guess myself, though.*

Documentation girl

Memories of student dynamics
viewed anew through a different lens.
Jessica, working in the mechanics lab
with her two lab-mates—Sergio and Billy.

Running a bending test.
I instruct them on how to use the equipment.
Jessica taking notes, writing down everything,
Sergio fussing with the equipment,
Billy commanding the PC.
"Who ran the machine last week during the tension test?"
Sergio starts, "That was Billy. I was on the PC."
I ask Jessica:
"Do you want to run the machine or the PC this week?"
"I'm really good at taking notes. I prefer this."
Really good at taking notes?
You prefer this?
Relegated to the side on her teams.
"Documentation girl." Note taker.
Again, and again.
Sexism operates through repetition
on student teams, in the classroom, in the field,
assigning roles until cemented,
until preferred (or not?).
How do I challenge this?
Force rotations on teams?
Question preferences and roles?
Another memory sharpens into focus...
Year-end capstone photo,
Four guys using equipment,
Jessica holds her clipboard.

As I walk back to my office following the committee meeting, I find myself questioning past experiences with students and colleagues. As I start to pass Cathy's office, I see her, and I stop. I pop my head through her door hoping we can talk for a bit. I'm torn because I know it's not her job to educate me on sexism. Still, I'm hoping that Sally's points from the meeting don't get shut down. "Hey, what do you think about what happened in the meeting just now? Have you had any experiences with the men in our program like how Sally said?"

"Umm, yeah!" Cathy bellows, without skipping a beat. "Oh, it happens all the time!" Cathy offers just a handful of her experiences, likely having never been asked to share by other men in the department. I ease myself in the chair across from her desk as she leans forward clasping her hands and shares.

How she's learned to protect her female students from male bullies. Listing off specific incidents with students—incidents I wasn't even aware of—of students that I know!

How she's stepped in to protect Sally from colleagues sometimes...

How she's advocated for female students to persist in the major...

How she's raised these concerns with administrators, yet feels that nobody's ever listened to her...

How... she goes on and on...

"One key thing I've learned," Cathy continues, starting another point, "is that I'll never have them compete in teams. Women don't do great in group work when it's competitive. The boys just take over; push 'em aside" (e.g., Secules, 2019).

"What?" I stammer at her, piqued by the notion of competitions being bad for student learning, "I do competitions in my classroom all the time! I thought it was fun for them..."

"Well, it's not." Cathy declares firmly. "Women in engineering seem to do better in collaborations than they do in competitions. But lots of engineering class projects are more so about getting people to compete. Gamification. I read a paper about how the boys get too excited and—"

"I didn't know," I start, "I really thought making engineering fun and game-like was a good thing. I used it in my class last semester and—"

"—and," Cathy continues, "Well, let me observe something since you're asking me about all this. Did you notice how you cut me off?"

"I cut you off?" I asked.

"Yup." Cathy confirms, "I was in the middle of talking, and you cut me off."

"I'm sorry," I meekly offer.

"Happens all the time," Cathy explains. "You did it to Julia, too. At the meeting."

"I did?"

"Yup. You and all the other guys do it. To me. To Julia. To Sally. Maybe now that you know, you can change that about how you interact with the women faculty and students."

"I'm sorry," I offer again with contrition, "I didn't realize it. Please, go on, Cathy..." My mind is trying to stay focused on this moment but revisits recent interactions with Cathy. I play back those scenes in my mind and introduce interruptions into those memories, now questioning what I meant by them and how they impacted her.

After a short silence, Cathy resumed telling more stories, and I made sure to listen.

I left Cathy in a bit of a daze, afterward, lost in thought as I walked back to my office to pack up and leave for the night. *Am I part of the problem, too? How can I be part of the solution?*

The role and onus on allies, advocates, and accomplices

In our preceding fictionalized stories, Cathy sought to educate Victor on gendered issues in the workplace, and as a result Bobby continued to seek her out to educate him on those same issues. However, these narratives are not a call for women like Cathy to educate men on their gendered experiences; the onus of learning from a myriad of resources should fall squarely on men in such masculine cultures (Anicha et al., 2020). Yet, we recognize that this invisible form of labor—where women *do* educate men on gendered issues—is a reality in higher education, particularly in STEM cultures. Yet, Bobby is acutely curious and outwardly receptive to learning more about gendered issues than Victor. As a result, Bobby is recognized by Sally as a colleague who is moving toward *allyship* by repeatedly exercising curiosity about her classroom experiences and by seeking to learn more from Cathy and other women.

The notion of individuals taking on allied roles and labels arises from inequitable sociocultural circumstances where members from an advantaged group take steps or are motivated to improve the status of disadvantaged groups (Ashburn-Nardo, 2018; Radke et al., 2020; Moore and Cox, 2021). Yet, taking on the mantle of an *ally* has diminished into a meaningless identity, failing to provide substantive actionable support for minoritized communities (Indigenous Action, 2014; Kalina, 2020). In our story, Bobby is attentively aware of gendered issues that Sally is voicing and offers words of support. Yet, he finds himself incapable to taking effective

action to challenge gendered issues either in his classroom or in the engineering department. Bobby's predisposition to recognize gendered issues, however, makes him inclined to move from simply a performative ally toward becoming an advocate in disrupting the status quo. As Jones (2021) writes,

> Compared to an ally, an accomplice assumes a greater amount of risk to take an active, substantive role to challenge and overthrow the systems, institutions, and norms that lead to inequality. Accomplices confront their own status and privilege to determine what risks they can take, and embed justice across all aspects of their work (p. 3).

Advocates voice support for policies that seek to redress inequities while accomplices (or co-conspirators) additionally subvert, challenge, and disrupt the inequitable status quo (McIntosh, 2020; Moore and Cox, 2021). By asking himself how he might be *part of the solution*, Bobby is taking the first steps toward self-reflexivity; to interrogate and understand his own unearned power and privilege as a male member in a masculine culture to positively influence and shape the disadvantaged experiences of female members.

What does the action look like in "a call to action?"

In order to challenge the masculine culture endemic in the engineering academy, there must be opportunities for open, meaningful discussion of gendered challenges found in the workplace, the curriculum, and classroom. Such world making activities are grounded in allyship, relational support, critical dialogue, and reflexivity.

Callie and Daniel, as minoritized faculty in engineering, were acutely aware of inequities in engineering for many years preceding this work and in fact were well read and familiar with the notions of gendered and racial issues in STEM. Yet, neither felt equipped to connect those data in the literature to their own day-to-day lives. It was only by undertaking this deliberate, autoethnographic effort in journaling and dialogue with one another in which each co-author's experiences was vulnerably shared and emotionally validated, given space for reflective analyses, and connected within a larger web of experiences was the abstract made real. Our individual experiential knowledge—of gendered oppression—is necessary, but insufficient to affect any systemic change. To be sure, communication is not a panacea to redressing gendered inequities. Yet, this process demonstrates how autoethnographies such as ours might serve as a "narrative blueprint" for other readers (Fox, 2007, p. 8, 2014, p. 974). Fox (2007) describes narrative blueprints as "personal tales made public with the intent of inspiring identification among audience members seeking a narrative model to help guide future actions and behaviors" (p. 8). Individuals must be willing to engage in deliberative processes that can be uncomfortable, challenging, and disruptive (e.g., Aberasturi-Apraiz et al., 2020) as part of larger structural change effort (e.g., Taylor, 2009).

Mediated autoethnographic methodologies, specifically collaborative autoethnographic processes, offer an invitational framework for individuals to explore their selves within the context of an organizational unit, like an engineering department. Callie and Daniel engaged in routine-daily journaling, specifically capturing observations and emotional experiences of their day-to-day interactions with others. On a weekly basis, those journals were discussed to make sense of *meaning* and *patterns* to those experiences (e.g., Kezar, 2013), which spurred explorations in the literature to make sense of connections to broader patterns in the field. This type of reflective and observational work is only valuable if the individual is willing to be vulnerable in their observations; that is to say, to not simply observe the world around them (students and colleagues) as events happening outside of their control but rather as events *influenced* and *shaped* by their own contribution to the world itself: as either a *teacher* to students or as a *co-worker* to colleagues. To wit, individuals must be vulnerable in accounting for how their own presence, actions, and inactions contribute to the characteristics of the culture at hand.

It is imperative that a workplace culture not simply have a handful of agents striving for enhanced understanding and creating individual change; it is necessary for many, if not all, organizational members to be engaged in the cataloging of their experiences in relation to others to identify and act upon inequities in that culture. Yet, smaller efforts can catalyze more systemic ones. Open discussions of inequity must be normalized, welcoming the perspectives that challenge privilege, stories lived experiences of systemic inequities entrenched in the organizational unit. The normalization of discomfort cultivates a climate that encourages its members to not just better understand those inequities that they themselves have not necessarily experienced firsthand, but also to reconcile their own participation in reproducing inequity.

Our call to action is not dissimilar from those raised by others. Yet, we recognize that organizational change that promotes positive culture-building is not driven by top-down approaches, like mandatory workshops or training sessions. Rather, authentic organizational change is seeded, fomented, and driven by bottom-up cultures; where the individual members of a community demand for systemic changes through workplace resistance (Collinson, 1994; Fleming and Spicer, 2007; Frandsen et al., 2020). Our call to action repeats the plea for allies and accomplices to reinforce their effort and move toward collaborative dialogic efforts modeled by the values of autoethnography toward understanding and shaping organizational cultures. Building dialogic interventions within engineering cultures like ours—both organically and intentionally—can be contagious, normalizing challenging the status quo rather than leaving women to "work through the muck."

Portends in engineering and STEM: The gendered cliff

Our paper stories how two engineering faculty came to realize the gendered experiences within a masculine-dominated engineering department. We did so at a time when the COVID-19 pandemic laid bare and exacerbated systemic inequities entrenched in the nation, including gendered challenges that men and women face in the workforce (Del Boca et al., 2020; Yavorsky et al., 2021; Krivkovich et al., 2022). The ensuing Great Resignation in 2021 saw the US labor market churn, where women across nearly all labor market categories withdrew from the labor force at rates about one percentage point higher than men (Fox, 2021). In fact, a global survey by Gotara (2022) reported that 50% of women in science, technology, engineering, and

mathematics (STEM) careers are ready to resign with 56% planning to resign within 0–3 months. Krivkovich et al. (2022) reports that upwards of 10.5% of women leaders are leaving their companies, the highest rate in years. We made sense of our gendered experiences in our local context in relation to the Great Resignation that women in the engineering and STEM workforce are facing.

The accounts storied in this paper offer narrow insight into the chronic, systemic, and national pain women in engineering cultures have experienced throughout the twentieth Century and well into the 21st in our post-pandemic moment. Unabated, women will continue to leave an unwelcoming engineering culture. We fear this as a portend of what is to come: that the workplace cultures in engineering and STEM will continue to resist organizational change, contributing to an exodus of women from engineering. This fear is made more real for us since Callie, in fact, resigned her faculty position in August 2022 to pursue a STEM research and development position outside of academia.

Yet, the authors maintain hope for a better future. In our reflexive efforts, the engineering authors gained vocabularies, insight, and tools to challenge gendered inequity issues in engineering, and they forged a community of accomplices that has spurred disruptive conversations in the department and other spheres of influence in engineering. *This collaborative autoethnographic work has been catalyzing and risky* (e.g., Emerald and Carpenter, 2015). While this paper attempts to story the inequity of gendered experiences within one engineering community at a specific moment in time, small collaborations, and communities of accomplices are insufficient to truly lead to transformational change at any institution. True, authentic organizational change must be driven by both bottom-up approaches coupled with structural change that puts practices into place that redress systemic inequity. To move toward structural change, we need to move beyond allyship into networks of accomplices who actively agitate, prod, give voice, and seek to resolve the inequitable issues facing institutions of higher education—the very issues that can be too easily swept aside amidst the many challenges in our new, post-pandemic normal. It is only in responding to that clarion—toward creating networks of accomplices that seek structural change—that a more inclusive engineering culture might, finally, begin to be realized.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Funding

This project was supported by a James Madison University Provost Faculty Curriculum Development Grant.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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