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”It is really isolating, to be honest”: A Case Study of a Transwoman in Engineering

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“It is really isolating, to be honest”:
A Case Study of a Transwoman in Engineering

CoNECD 2025

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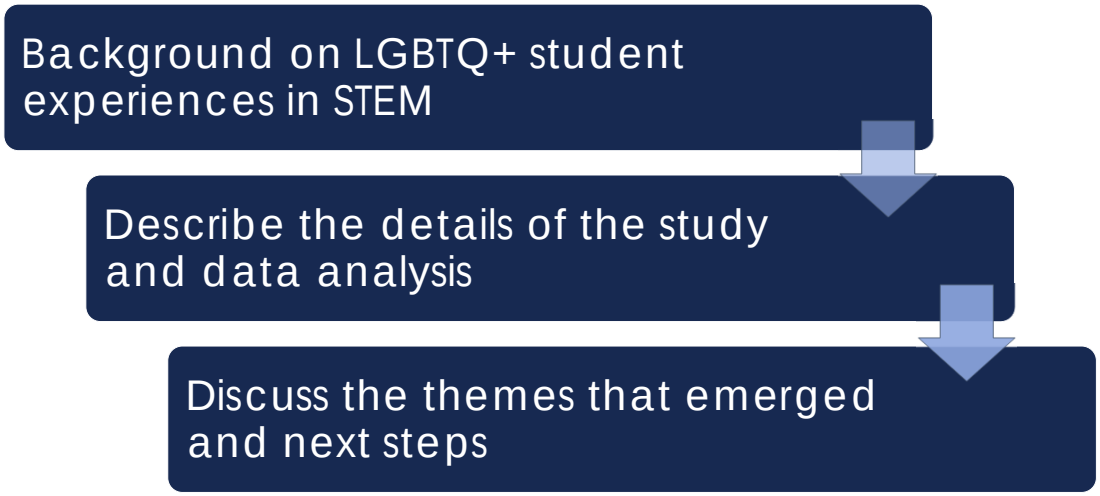
The University of Texas at Austin

Roadmap


Background on LGBTQ+ student experiences in STEM
Describe the details of the study and data analysis
Discuss the themes that emerged and next steps

Language Used

I will be using the terms “LGBTQ+” and “Queer” interchangeably to refer to anyone with a marginalized sexual or gender identity.

I will be using the term “transgender” to refer to someone whose gender identity does not align with their sex they were assigned at birth

I will use the term TGNB to refer to anyone with a marginalized gender identity outside of the male/female binary

I will be using the terms “LGBTQ+” (standing for Lesbian, Gay, Bisexual, Transgender, Queer) and “Queer” interchangeably to refer to anyone with a marginalized sexual or gender identity. I acknowledge the problematic history of the term “queer” which has previously been used as a slur for LGBTQ+ people. I have intentionally chose to use this word to continue reclaiming it [1]

I will be using the term “transgender” to refer to someone whose gender identity does not align with their sex they were assigned at birth

I will use the term TGNB (Transgender, Gender Non-Conforming, Non-Binary) to refer to anyone with a marginalized gender identity

Author Positionality

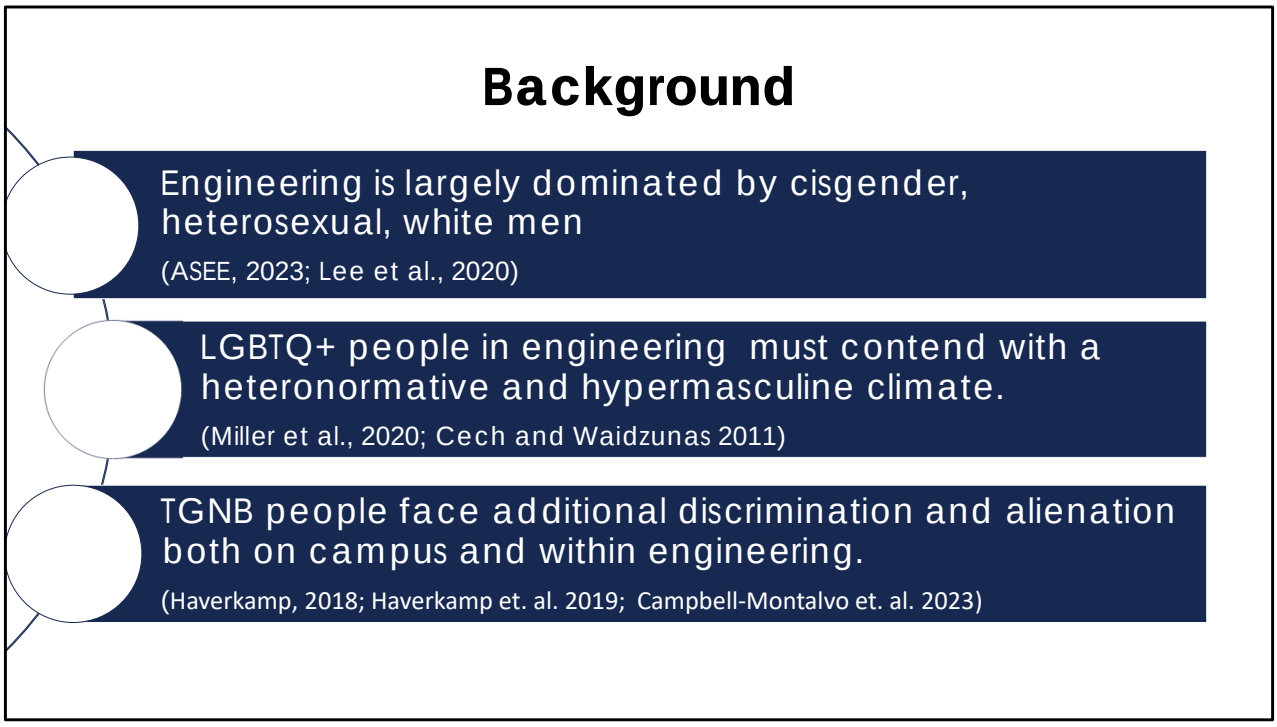
Jill Castle (She/Her)
2nd Year PhD Student
Mechanical Engineering

Brandon Bakka (He/They)
6th Year PhD Student
Biomedical Engineering

Dr. Maura Borrego
Professor, Mechanical Engineering
and STEM Education

Before we dive into the larger context of this research, we wanted to share our positionalities. We wanted to briefly share the positionality of the researchers working on this study, in order to situate the work in the context of our lived experiences. It is important for us to acknowledge the social identities that we carry since all qualitative research is inherently influenced by the identities of those who conduct the research. [2]

I [The presenter] am an engineering graduate student who identifies as a queer, white, non-binary man. My research focuses on the experiences of LGBTQ+ identifying engineering students. This work was done in collaboration with another engineering graduate student who identifies as straight, white, cisgender woman who first received her bachelors in engineering in the mid 90s. Her current research focuses on broadening participation of TGNB students within engineering and identifies as an ally to LGBTQ+ People. This work was done under the supervision of a straight, white, cisgender woman who is the faculty advisor of the two other authors.

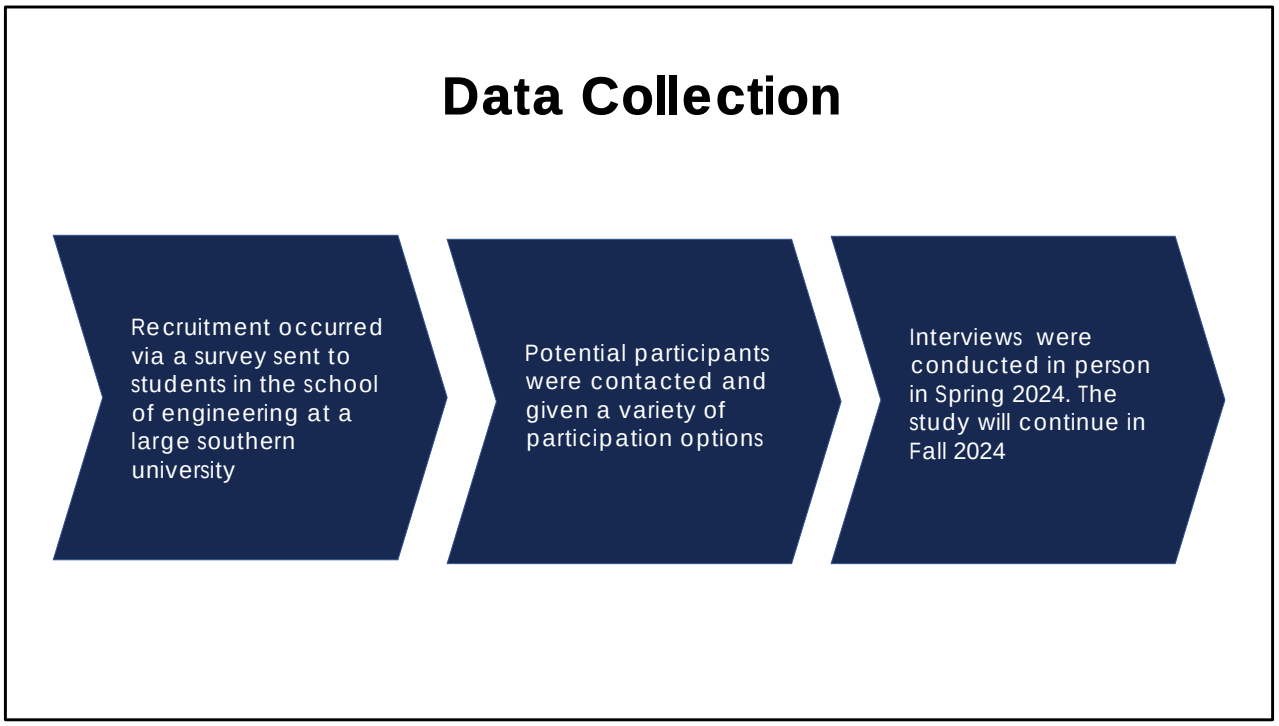


Despite broader efforts to improve diversity on college campuses, science, technology, engineering, and mathematics (STEM) majors remain largely dominated by cisgender, heterosexual, white men [3], [4], [5]. In order to create change and increase representation within STEM we have to understand the factors that lead to experiences of marginalization and attrition for these students. Until recently studies have largely focused on the experiences of Many studies since have demonstrated the persistence of this harsh climate and the subsequent masking strategies LGBTQ+ use. For instance, Miller et. al. found that students perceived engineering as particularly hostile and hypermasculine, characterized by a competitive environment and a pervasive “bro culture” that was explicitly anti-LGBTQ+ [9]. Other studies demonstrated the ways that LGBTQ+ students were rendered invisible within engineering [10] and how they struggle to make sense of a professional culture that is defined by heteronormative expectations [11]. Furthermore, LGBTQ+ students at the intersections of other marginalized identities, such as race and disability, face unique challenges and often feel invisible or excluded from LGBTQ+ community spaces [12], [13]. This harsh climate ultimately pushes LGBTQ+ people out of STEM majors [14] and results in exclusion, harassment, and health and wellness issues in professional settings [15], [16]

This chilly climate is especially salient for transgender, gender non-conforming, and non-binary (TGNB) engineering students who must deal with not only the culture of engineering, but an increasingly anti-trans political climate [17], [18] and higher rates of harassment on college campuses [19]. The small body of existing literature shows that TGNC students struggle with the masculine and rigid expectations of engineering. Additionally, these students are likely to be worried about backlash from transitioning, and seek refuge outside of engineering and in online spaces [20]. A study by Campbell-Montalvo et. al. [21] also showed that TGNC students were less likely to see benefits and find a sense of community in organizations catering to LGTBQ+ students in STEM such as oSTEM (out in STEM).

What unique challenges do TGNC students face within engineering?

Knowing the negative experiences of LGBTQ+ students, and high rates of attrition for this population, we wanted to better understand the things that contributed to this climate for these students to know what things to target for change. The research question guiding this work is: How do interpersonal (relationships with peers, professors, etc.) and environmental factors (i.e. classroom settings, curriculum, etc.) contribute to LGBTQ+ students experiences within engineering ?

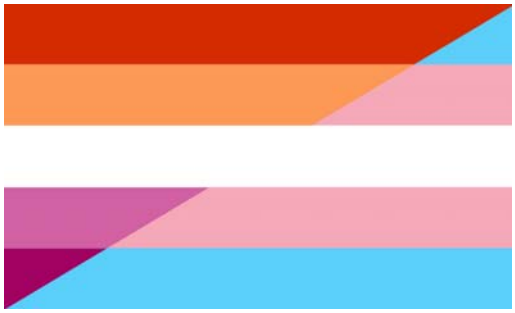


This interview was a part of an ongoing study conducted at a large R1 institution in the south. The goal of the larger study was to better understand how different social relationships (i.e. relationships with peers, engineering faculty, etc.) drive experiences for LGBTQ+ students on campus. To accomplish this, a screening survey to collect participant demographic information and quantitative data around experiences in engineering was launched in Fall of 2023. The study was advertised via flyers put up in engineering buildings, and was emailed to all engineering undergraduate students from the undergraduate program coordinators of their respective departments. The survey included a participation incentive where all participants would be entered into a drawing to receive one of five $20 Amazon gift cards to increase response rate. Additionally, this survey was framed as a general study on the experiences of all students within engineering to encourage participation regardless of identity.

Semi-structured interviews were conducted in Spring of 2024. All of the LGBTQ+ identifying students who completed the survey (N = 12) were invited to participate in this phase of the study and 3 students accepted. The interviews were 60 minutes long and conducted in person in private meetings

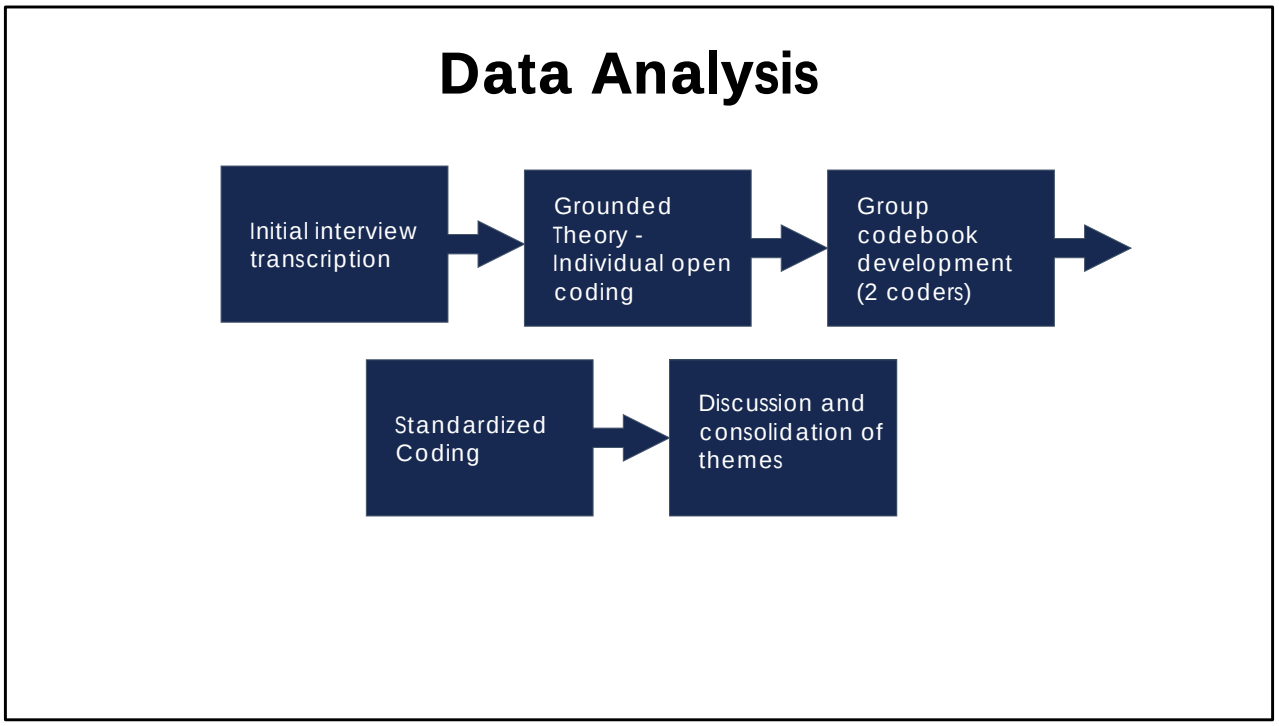
rooms within the engineering department. The interviews were led by an undergraduate student researcher, and were supervised by a PhD student who managed the recording software, took interview notes, and helped ask follow up questions to participant responses. It is important to note both interviewers identified as LGBTQ+ and disclosed their identities to the participants at the beginning of the interview.

Case Study Subject



Pseudonym: Konkon
Academic Role: 4th year Engineering Student
Disclosed Identities: White, Transgender Woman, Neurodivergent, Disabled, Lesbian

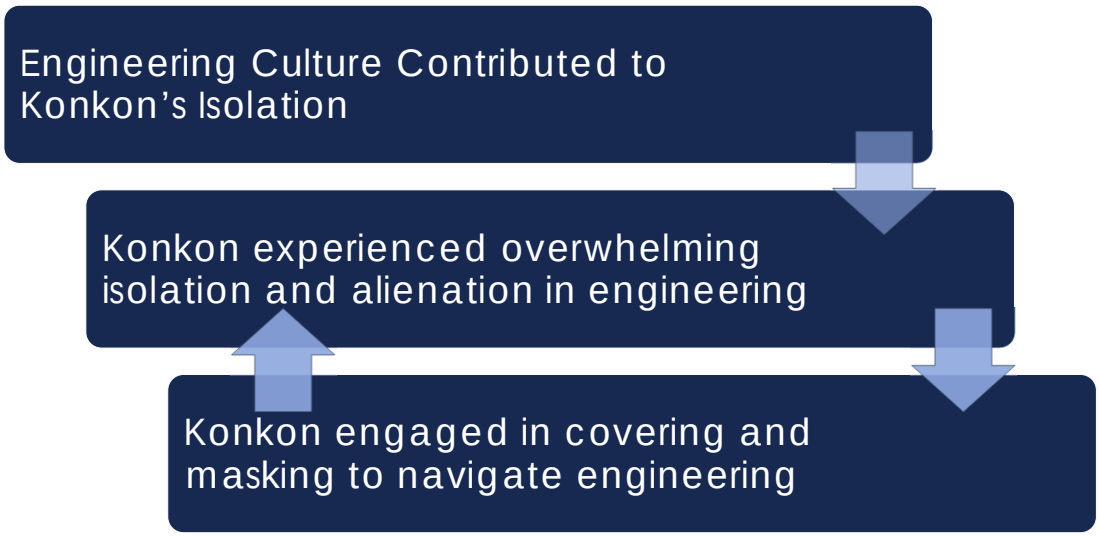
While going over the interviews obtained in Spring to prep for additional interviews in Fall, we were particularly interested in one from a Transgender woman who had a highly unique experience within engineering. We were drawn to her as a case study due to her multiple marginalized identities that are highly understudied in engineering (i.e. transgender, lesbian, neurodivergent). Additionally, we found that since Konkon had transitioned during her undergraduate career she had a lot of unique experiences and was able to provide insight in how her relationships and experiences in aerospace engineering settings changed after socially transitioning. We decided to perform an in depth analysis of her experiences to better understand the factors that contributed to her perceptions of engineering.



The interview was transcribed by whisper.cpp [22] an open-source automatic speech recognition software. We transcribed the interview multiple times using the provided models and selected the one with the highest transcription quality. The models were run locally to ensure participant privacy and confidentiality.

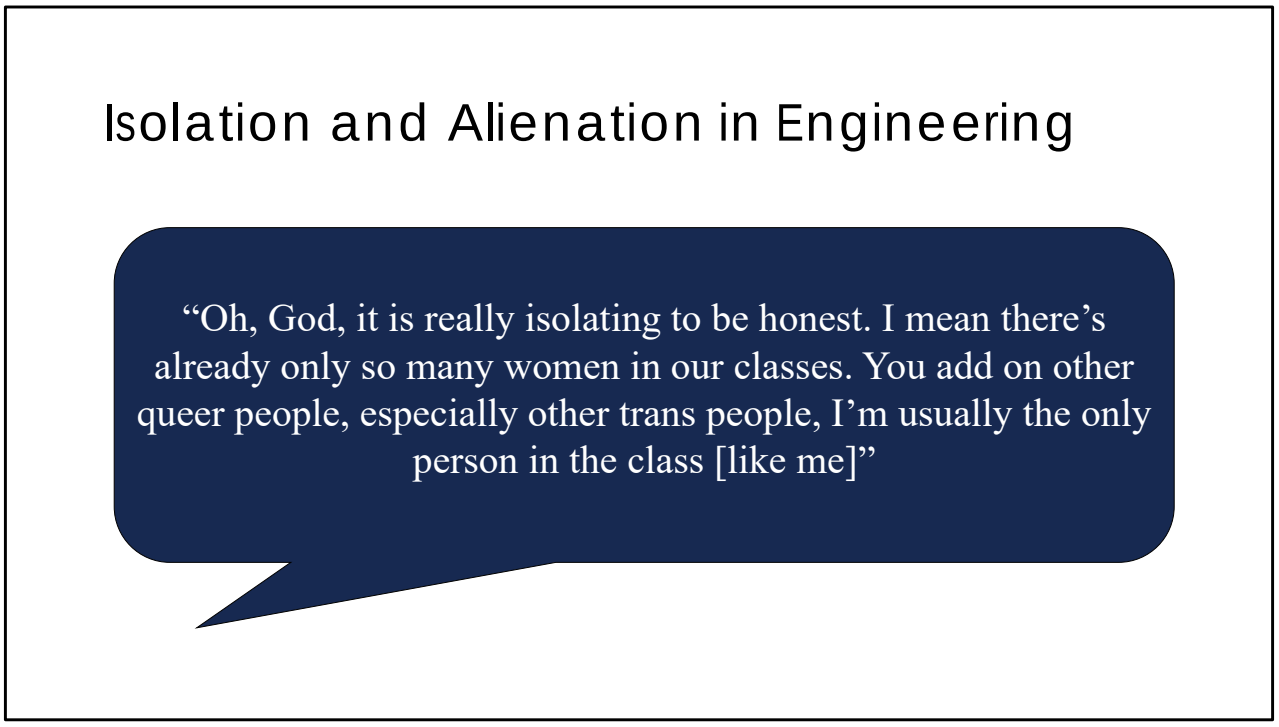
The data analysis was based in grounded theory [23]. The authors of this paper first conducted independent open coding of the interview before meeting to discuss their findings and develop a standardized code book. The interview was then recoded with this standardized codebook, and the codes were grouped together into the themes presented in this paper.

Results


Engineering Culture Contributed to Konkon's Isolation
Konkon experienced overwhelming isolation and alienation in engineering
Konkon engaged in covering and masking to navigate engineering

Results

Konkon experienced overwhelming isolation and alienation in engineering



Konkon repeated brought up feeling othered in engineering spaces, and the alienation that comes from "being in a room with no one else like you". Konkon even compares themselves to an "incomprehensible eldritch being" to really emphasize how different they feel from their engineering peers due to both their transness and their neurodivergence. While much of this feeling of othering or alienation came from lack of others like her, the actions and attitudes of other engineering students contributed to this feeling. She notes that while her peers have not been overtly antagonistic, they occasionally seem "uncomfy" in her presence. Konkon also mentions that many of her peers give off a "bad vibe" in regards to their opinions on trans people. These comments show the way that implicit transphobic comments and attitudes are picked up by Konkon and contribute to her isolation.

Negative Impacts of Isolation

Mental Health Impacts	Academic Impacts
"it's probably **not the best for mental health** either, just because in general, **feeling isolated does not help**."	"I **definitely missed out on some opportunities for peer help with study groups** and things like that, just because I haven't really talked that much with most of the other people in my classes."

Overall, we found two overarching negative impacts of isolation on Konkon's experiences in engineering – Mental Health and Academic Impacts. Unsurprisingly isolation had a negative impact on Konkon's mental health, as she often felt like she didn't belong or have any community within engineering to turn to. Additionally, the lack of support or study networks results in a negative academic impact for Konkon as she is unable to get academic support from her peers.

Results

Engineering Culture Contributed to Konkon's Isolation

Konkon experienced overwhelming isolation and alienation in engineering

Engineering Culture Contributes to Isolation

Masculinity in Engineering

- "I'd go to work in a very masculine environment in general. But also, I'd look over my boss is watching ... Turning Point USA videos"

Militarization in Engineering

- "Especially aerospace in particular… it's split between the people who don't want to work for a defense company… and [those who] want to blow up people in the desert"

This masculine environment, along with her boss watching conservative political videos, made Konkon feel unsafe and uncomfortable within this technical role. This masculinity was present in engineering spaces on campus as well. Interestingly, Konkon equated aspects of masculinity with militarization in engineering. She criticized many of the masculine "dude-bro[s]" in engineering as being excited to work for defense companies and wanting to "blow people up in the desert". This perception of engineering, and particularly the aerospace sector, as heavily aligned with the military made Konkon feel uncomfortable. Wanting to avoid this militarization, she discussed taking a role with "NASA or a public civilian sector" instead of just "going against my ideals and just lining somebody's pocket."

Engineering Culture Contributes to Isolation

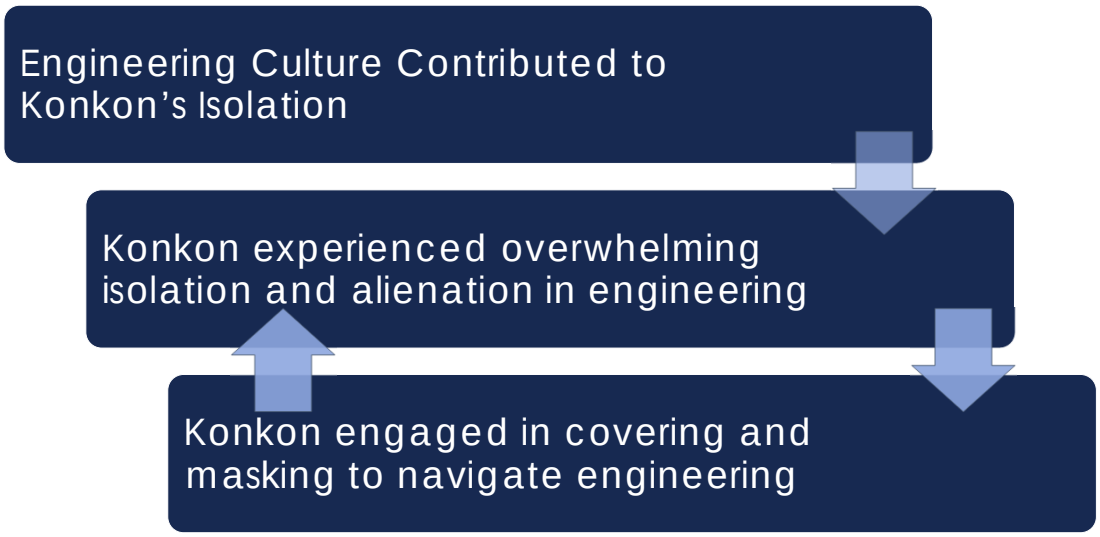
Engineering as Uniquely Bad

- "As far as LGBTQ stuff, outside of engineering, specifically in humanities, professors are much more proactive about those things."

Konkon felt that these cultural factors were unique to engineering. She spoke of computer science being more welcoming and liberal arts being more socially accepting She spoke on this distinction much more broadly, mentioning that "in humanities professors are much more proactive" about LGBTQ+ issues, and that asking for pronouns is something that "you usually only see outside of engineering". Konkon even perceives other STEM majors as being more accepting, noting that she has many friends in Computer Science and that it is "the stereotypical trans girl major".

While we would like When asked about ways to improve this culture, Konkon felt overwhelmed by the culture of engi current point in time that there's anything like that be done, just because a lot of it is very just-- it's either culturally ingrained to the field, or it's just the general demographic there." and "I just don't know how you'd approach fixing this, because it is such an ingrained thing that there's not really a specific thing you can do really about it.". This only contributes to her feelings of isolation and loneliness.

Results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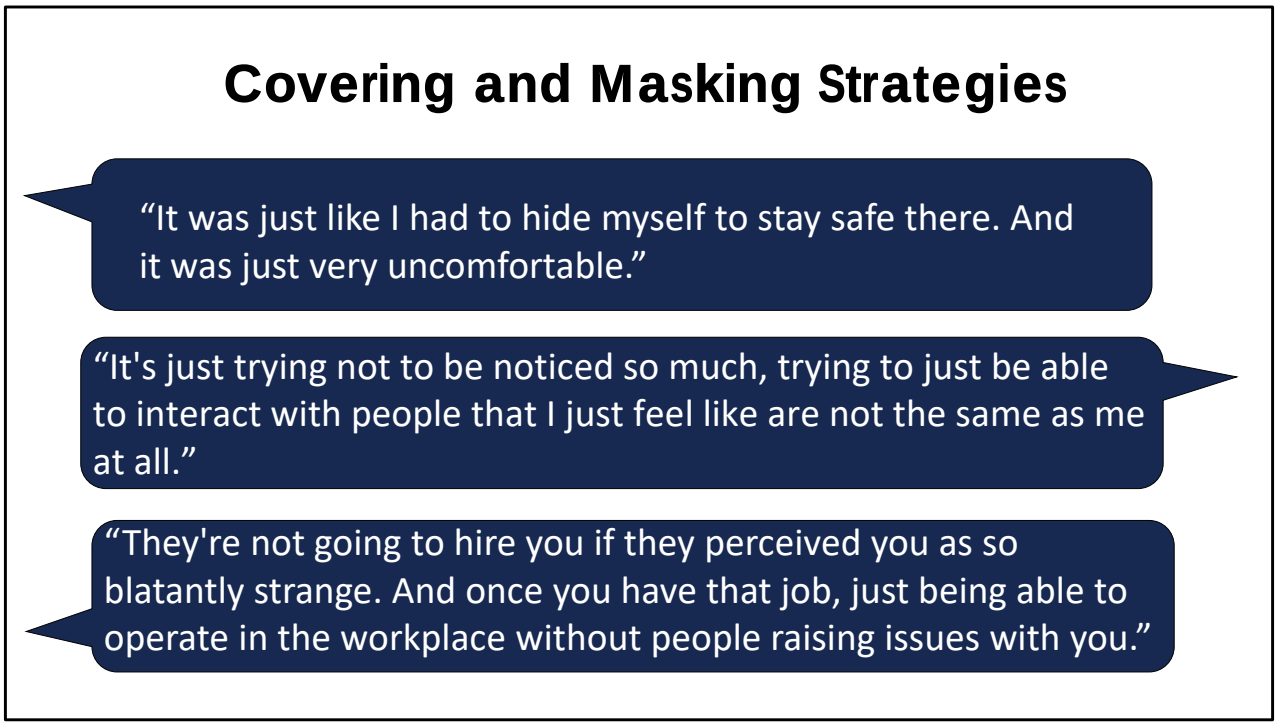
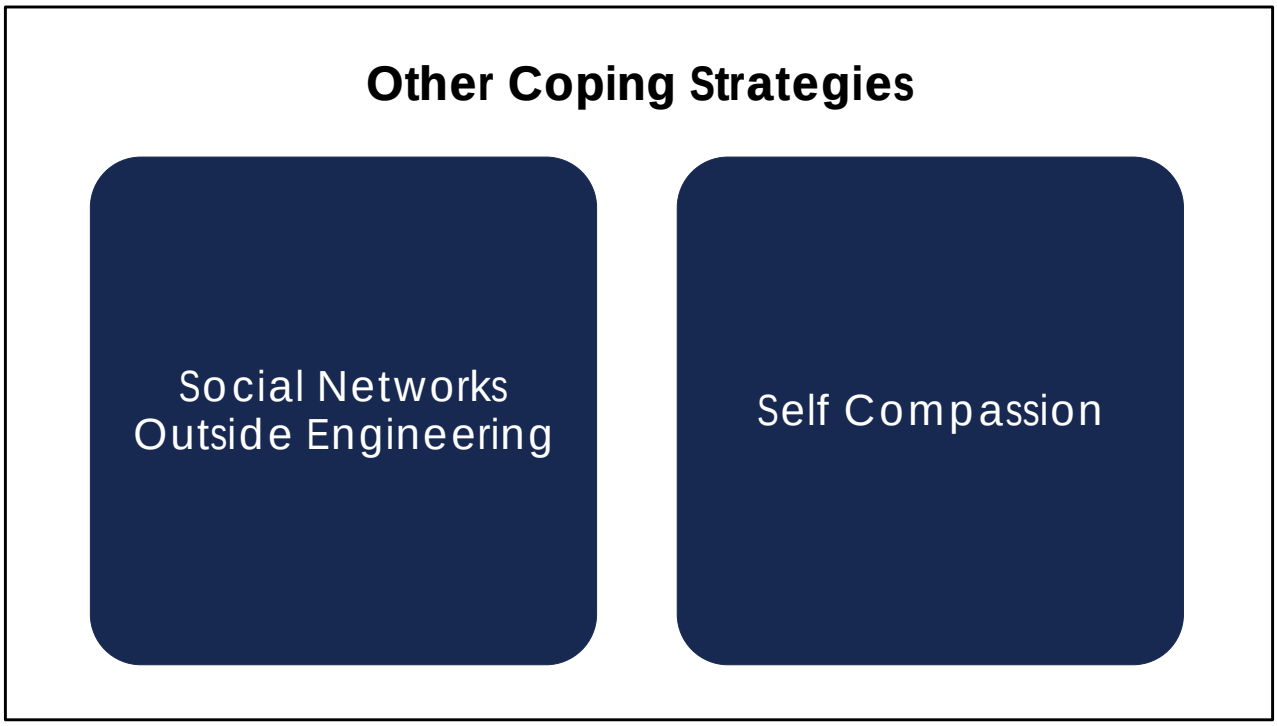


In response to this isolation and climate, Konkon largely relied on covering and passing strategies to persist in engineering.

When talking about her experience at her technical internship, Konkon felt as though this covering was a requirement for her safety, stating:

It's just trying not to be noticed so much, trying to just be able to interact with people that I just feel like are not the same as me at all." and that she felt like "Among peers, I don't really have anyone that I feel close enough to that I would … even just mask with less."

They're not going to hire you if they perceived you as so blatantly strange. And once you have that job, just being able to operate in the workplace without people raising issues with you.



In addition to covering and masking within engineering, Konkon also relied on her social network outside of engineering. She described a "very small" group of "close friends and partners" that she "can very consistently talk to". These friends and partners were incredibly important to Konkon, with her saying she would "probably be breaking down if it wasn't for them". These friends were largely found in online communities or on campus clubs, such as a board game club. Konkon also clearly found safety and community with other LGBTQ+ people, saying "almost everyone in [her boardgame group] is queer" which was "a lot more comfortable" for her as she didn't have to worry about judgment or prejudice.

Konkon has relied on her own self compassion to get through the climate she faces in engineering, saying "I just have to be really gentle with myself".

Impact of Transitioning

Positive Impacts	Negative Impacts
• Mental Health Improvements • Benefits on Socialization	• Increased feelings of isolation and otherness • Implicit transphobia

Despite some negative experiences, it must be emphasized that transitioning largely had a positive impact on Konkon. One thing she discussed was her transition having a positive impact on her mental health. Prior to transitioning she was “feeling like a machine” and “just kind of empty”, but transitioning has made her “more here and more present and more expressive”. Finally, transitioning had positive social impacts for Konkon. She describes being approached more by other women within engineering and that she is able to “talk to women in classes more”. She attributes this to being “less threatening and off-putting" both from her positive mood changes from transitioning and more feminine presentation. Konkon also attributes this to the “distinct difference between how men interact and women interact”, meaning she has more small talk and gets more compliments from her peers.

Konkon felt more othered after transitioning. While she mentioned always feeling “weird and distant” from the “more masculine guys”, prior to transitioning she would engage somewhat with this group. Prior to transitioning, she “talked to them more often” and would occasionally “eat lunch with them”. This changed after transitioning, as she says, “I just don’t even really talk to them” now and attributes this to her increased feelings of alienation, saying “[The isolation] was already there,

but it's much more". Interestingly, she notes that the feelings of being othered were actually "more subtle now", further alluding to transphobia manifesting in implicit ways within engineering spaces. In addition to the feeling of alienation, Konkon discusses the burden of transitioning while dealing with academics and holding multiple marginalized identities:

Next Steps

- Increase the Sample size to better understand student experiences
- Determine the impact of state anti DEI legislation

Takeaways

- Create more open and welcoming classrooms
  - Asking and using pronouns is important
- Pushback against anti DEI legislation

Thank You!

Award #: 2051502

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