

# Developing Feminist Technologists

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## Abstract

Computing has a history of perpetuating injustices, a pattern that has only seemed to grow worse over recent years. These injustices are a direct result of computing's epistemic values and practices, which suggests the need for computing to adopt alternative epistemic values and practices, including sociopolitical awareness, reflexivity, humility, and an explicit commitment to justice. These are the central values of feminism, but while scholars have developed theories about how feminist values could reshape computing, there is a need for more research into how to practically integrate feminist values into computing practice. Additionally, given that computing education reinforces and reproduces the dominant computing culture, there is a need for further research to imagine how computing education could be transformed to teach developing technologists how to integrate feminist values into this practice. I conducted a small-sample, in-depth interview-based study to understand the experiences of people who are developing into or practicing as feminist technologists. Through my research, I identified six common characteristics of feminist technologists, including a commitment to care, awareness of power structures, practice of epistemic humility, application of systems thinking, and negotiation with the tensions in integrating feminist values. I also identified two common types of experiences that help develop people into feminist technologists: experiences that foster feminist consciousness-raising and experiences that positively model feminist values. These insights suggest alternative ways of understanding the development of feminist technologists as a continuous process, where being and becoming a feminist technologist is one and the same, that requires a foundation of emotional safety.

# Introduction

In *Living a Feminist Life* (2017), Sara Ahmed said, “The question of how to live a feminist life is alive as a question as well as being a life question.” I have been trying to answer this question, subconsciously and consciously, for most of my life.

I first encountered feminism as a young woman of color growing up in America after immigrating to the United States at the age of seven. At the time, I didn’t have the language to call it “feminism”; I could only recognize it as an internal discomfort and frustration with the way of the world, which even then, I could see disadvantaged me in ways that felt tied to my gender and my race (though I wouldn’t have been able to name that). Years later, as I endured more racialized and gendered micro- and macro-aggressions and gained more language to describe the world, I started to develop a feminist identity and feminist values like equity and justice. But at the time, I would not have called myself a feminist. I struggled with the word “feminist” for most of my high school and early college years because I had never seen anyone like me represented as a feminist, and it didn’t seem to me like the feminist movement cared particularly about women like me.

Early in high school, I started to learn how to code and I was immediately enchanted by the power of computing and its transformative possibilities. One of my first major projects was an app designed to help women walking alone on streets stay safe by connecting them to trusted contacts and providing them with access to emergency resources. This app was my attempt to put into action my value for equity through my love for computing. Around this time, too, I started learning about intersectional feminism and expanding my definition of what feminism could encompass, becoming passionate about liberating all women from systems of oppression. Though I wouldn’t have called it that then, the app was my first attempt towards feminist computing, grounded in values of care and community. The app was also part of the reason why I entered Olin with a deeply tech-solutionist mindset. I was excited to learn how to broaden my skill sets in computing so I could address *any* problem — and *especially* other challenging societal problems that require bold, imaginative solutions.

But throughout my time at Olin, I began learning about all of the ways that computing can create more problems than solutions—even, and perhaps especially, when it’s intended to help. I learned about the myriad ways that computing has already been used to perpetuate harm: perpetuating biases of all kinds (Angwin et al.2016); disproportionately harming marginalized groups (Barocas and Selbst 2016); dehumanizing entire groups of people (Noble 2018); enacting violence (Hoffman 2018, Onouha 2018); widening gaps of inequality by preventing people from accessing social services (Eubanks 2019, Obermeyer et al.2019, O’Neil 2017); spreading hateful ideas (Rose 2019, Vincent 2016), and facilitating the oppression of minorities by the state (Empower LLC 2018, Mozur 2019).

And then, in my sophomore year at Olin, I had a transformative experience that fundamentally shifted my relationship to computing and feminism.

In the fall semester, I and a team of other students connected with an anti-human trafficking non-profit that focuses on extracting victims and preventing human trafficking. My team was part of PInT, a student-led public interest technology project team at Olin that I co-founded. One of PInT's cornerstone programs was a student-run consulting clinic that offered pro-bono technical consulting to organizations working in the public interest. I had worked with this non-profit prior to PInT at a hackathon focused on tech-based interventions against human trafficking; in fact, my experience with this organization at the hackathon had been one of my inspirations for creating PInT. I respected their work deeply and collaborating with them had been an incredibly gratifying experience.

Our partner organization proposed a potential tool for us to build that they believed would be useful for their work: a web scraper to scrape escort sites for ads where the posters could be potential victims of human trafficking. They had been manually scraping ads for over a year with some success, and hoped that automation would enable them to identify and rescue more victims.

Initially, I was over the moon. The project seemed to exemplify the goals of PInT and of public interest technology more broadly: building technology to help vulnerable people, in partnership with external social-good-oriented organizations. Initially, we jumped right into implementing the web scraper until our advisor, Professor Erhardt Graeff, in conversation with an expert who had worked on the intersection of technology and sex trafficking, raised a few questions that caused us to pause, step back, and question some of our underlying assumptions.

Erhardt raised questions that were deeply uncomfortable and unlike the kinds of questions I was used to asking myself about technical projects. His concerns weren't focused at all on the technical implementation of the tool, but rather our partner and the system that we would be affecting. He drew our attention to a critical stakeholder who we had previously completely ignored: voluntary sex workers. Erhardt shared resources that drew light on the dangers of non-consensually collecting data on sex workers and sharing this data with law enforcement. He also shared resources that forced us to question the actual benefit of web scraping to human trafficking victims as well, like danah boyd's research (boyd 2013, boyd 2012, Musto and boyd 2014).

Though I did not have the language to recognize this at the time, Erhardt asked questions that were illuminating the power structures underlying the project and our problematic position within these structures. Though I was intimately familiar with power structures due to my experiences as a woman of color, and though I had been growing increasingly aware of the harm that computing could do, these harms had always seemed like they manifested in some abstract far-off place by developers who simply did not care and/or were ignorant to dimensions of power. It felt like a rude awakening to realize that I *did* care and *was* aware of dimensions of power, and *still* had failed to anticipate these harms. This felt especially shocking in a project that was ostensibly aimed at liberating women from systems of oppression, which was my goal as a feminist.

Beginning to process these questions, my team halted all technical development and began a process of deliberate investigation and reflection. We went back to our partner and began asking them more probing questions like: What do you do to ensure that victims are cared for afterwards? What does your relationship with law enforcement look like? How do you ensure that voluntary sex workers aren't caught in the cross-hairs of this tool? What does "protecting" victims really mean to you? Their answers felt too evasive and unsatisfactory to us, so we reached out to Professor Jennifer Musto, an expert in tech-based interventions to human trafficking and the relationship between human trafficking and the carceral state. Prof. Musto described the problematic ways police treat both victims *and* sex workers. She provided historical context for the potential harms of interventions by telling us about the SESTA-FOSTA bill, which, while intending to prevent human trafficking, created a policed environment that forced voluntary sex workers into riskier and more dangerous situations (Musto 2018). She also drew our attention to the fact that our partner organization had no representation of victims or connection to survivor support or advocacy groups. In fact, comprised mostly of cis white men from ex-military backgrounds, the organization looked a lot more like the police than the people they wanted to "rescue."

Prof. Musto's resources helped us better understand the power dynamics between our partner and our stakeholders and situate ourselves amid these dynamics. This fundamentally shifted my perspective of the tool we were being asked to build; I could envision the massive harm that this tool could cause, especially if applied at scale. Furthermore, this awareness fundamentally shifted my assumptions of what "serving the public interest" or "helping people" using technology looked like in this case. My team and I started to consider whether perhaps the ethical thing to do in this situation would be to refuse to build the tool — a possibility that I had literally never conceived of before.

We deliberated for a long time, weighing lots of factors including: our personal reputations, PInT's reputation, our relationship with our partner, our feelings of shame at "failing" if we did not build the tool, and our desire and commitment to do no harm. We worried that if we did not build the tool, then perhaps our partner would find another student group to take on the project. We considered introducing a number of stipulations, like asking our partner to build relationships with survivor and sex worker advocacy groups and ensure that they would not be mistreated by the police. Perhaps these measures could mitigate the harm.

However, we realized that it would be difficult to convince our partner to agree to these stipulations. And even if we could convince them, none of these stipulations would matter within a legal system that didn't treat victims or sex workers with care. Ultimately, we determined that we could not negotiate with or compromise on our values. We weren't willing to accept "minimal" harm when we were committed to doing *no* harm. This was a red line we would not cross. So instead, we took a more assertive position: we would not build, under any circumstances. Full stop.

This experience of design refusal fundamentally changed the way I practice computing. It forced me to challenge my deepest-rooted assumptions of the inherent good of technology and the

power of computing. I learned how to consider the impacts of my work beyond optimal and non-optimal or problems and solutions, but instead in terms of much more important impacts — specifically, the potential harms I could perpetuate. In the process, I learned how to meaningfully integrate my feminist values into my computing practice. I learned how to examine the imbalance in whose needs were heard and prioritized when constructing the problem framing that guided the project and understand the power dynamics that had produced this imbalance. I learned how to practice epistemic humility and critically question what I thought I knew (i.e., this would *definitely* help people) and determining what I didn't know (i.e., basically anything about human trafficking as a system). I learned how to reckon with my personal values and politics and how they affected my view of the project, and explicitly and deliberately draw clear lines around what I was and was not willing to support. Most importantly, I developed a commitment to the co-creation of more socially-just worlds, which is now core to my values and approach to the work I do. This became core to both my feminist identity *and* my professional identity, which now mutually inform one another. In short, this experience transformed me into a feminist technologist.

## Feminist Computing

My initial tech-solutionism and approach to the web scraper project reflect the standard culture and practices of computing. Scholars in the fields of science, technology, and society (STS) and critical technology studies have demonstrated how the epistemic assumptions and practices of computing directly lead to the harms that are produced by computing. For example, Green and Viljoen define the dominant mode of algorithmic and computational reasoning as “algorithmic formalism.” Algorithmic formalism consists of three key orientations: objectivity/neutrality, internalism, and universalism. The orientation towards objectivity and neutrality leads technologists to see algorithms, and by extension, themselves as objective and neutral and prevents them from “grounding algorithmic interventions in explicit definitions of desirable social outcomes”, contributing to the depoliticization of the field, and as a consequence leads to “acquiescence to dominant scientific, social, and political values.” The orientation towards internalism acts similarly by only emphasizing mathematical metrics legible within the language of algorithms, like efficiency and accuracy, thus ignoring aspects of the social and political context that are illegible within algorithmic reasoning. Consequently, the internalism orientation leads to algorithmic interventions that “optimize social systems according to existing policies and assumptions, drastically narrowing the range of possible reforms”. Finally, the orientation towards universalism assumes that algorithms are universally applicable and beneficial to any problem in any context. This orientation leads to technological solutionism (Morozov 2019) and techno-chauvinism (Broussard 2018), or the problematic assumption that algorithms can be applied to all situations and all problems. These beliefs consequently lead to problem frames that are conceived in terms of algorithmic logics at the expense of any other values and interventions that thus reproduce the status quo. Taken together, these orientations lead to depoliticized problem formulations that reproduce existing social conditions and policies, resulting in many of the injustices that we have witnessed computing perpetuate in the past.

While the field of computing has tried to address its injustices, it has relied on applying the same logics of technological determinism and solutionism at the root of these problems. For instance, although tech companies have tried to create roles for “ethics owners” to operationalize ethical reasoning within their companies, these “ethics owners” are often constrained by corporate logics that render their work insignificant (Metcalf et al. 2019). Similarly, scholars have documented how the movement for “ethical” AI and ML is often also trying to speak to business logics and excludes an explicit focus on social justice (Greene et al. 2019). Therefore, the field of computing needs to shift its norms, values, and assumptions. Scholars within STS and critical technology studies have articulated clear directions that they believe computing should pursue. Green and Viljoen (2020) propose “algorithmic realism” as an alternative mode of reasoning that is explicitly political, porous, and contextual. These orientations would lead to technologists who are self-reflexive and focused on dismantling unjust social conditions and policies; able to see computing as “instruments, as one type of intervention, one that cannot provide the solution to every problem”; emphasize understanding the social contexts they act in; and thoroughly question how their designs will interact with and impact communities in a given context with particular attention towards dimensions of power.

These orientations have always been at the center of feminism and a feminist practice. Feminist activist and scholar Angela Davis describes feminism as a methodology, emphasizing how feminism is attuned to power dimensions, explicitly political, expansive, and inherently pluralistic:

*Feminism involves so much more than gender equality. And it involves so much more than gender. Feminism must involve a consciousness of capitalism...and racism, and colonialism, and post-colonialities, and ability, and more genders than we can even imagine, and more sexualities than we ever thought we could name. Feminism has helped us to not only recognize a range of connections among discourses and institutions and identities and ideologies that we often tend to consider separately. But it has also helped us to develop epistemological and organizational strategies that take us beyond the categories “women” and “gender”. And feminist methodologies impel us to explore contradictions that are not always apparent. They drive us to inhabit contradictions and discover what is productive in those contradictions. Feminism insists on methods of thought and action that urge us to think things together that appear to be separate, and to de-segregate things that appear to naturally belong together. (Davis 2013)*

Scholars and practitioners have taken up feminism in both explicit and implicit ways, demonstrating how a shift to feminist norms, values, and assumptions could result in a computing practice that can help realize more socially-just worlds. Sasha Costanza-Chock (2020) presents “design justice” as an alternative technology design framework that is rooted in intersectional feminist thought. Design justice focuses explicitly on “the way design reproduces and/or challenges the matrix of domination” and “aims to ensure a more equitable distribution of design’s benefits and burdens”. The design justice principles articulate alternative design processes that are rooted in feminist values: centering the voices of those most marginalized by design and redistributing the power in the dynamic between designers and community

members. Design justice fundamentally questions some of the root assumptions of computing, like universalism; one of the principles of design justice is to know when *not* to design, reflecting a humility about the position and capacity of design. Mariam Asad's concept of "prefigurative design" (2019) extends upon design justice, integrating transformative justice and other feminist concepts into a research and practice that is focused on cultivating social relationships, distributing resources, and building counter-structures.

Tom Smyth and Jill Dimond's practice of "anti-oppressive design" (2014) is also similarly guided by feminist ideas. Specifically, anti-oppressive design frames all aspects of design work, including which problems designers work on, what questions and practices guide their work, and how they collaborate with and relate to one another, in terms of the anti-oppression framework, synthesized from feminist scholars like Patricia Hill Collins, Elisabeth Schussler Fiorenza, and Kimberlé Crenshaw. Anti-oppressive design explicitly defines good design as "that which strives to end one or more forms of oppression", taking on an explicit political stance that is in direct opposition to the standard norms and values of computing, like the orientations of neutrality and internalism. Smyth and Dimond enact this practice in a worker-owned social good non-profit that has worked on projects like Hollaback (Dimond et al.2013), a social movement organization dedicated to ending street harassment using online storytelling and LaborShare, an application that computes optimal task assignments for domestic labor according to time and preference and promotes "equality and visibility of home labor".

Within interaction design and computing, Shaowen Bardzell theorizes feminist human-computer interaction (HCI) (2010) as an alternative direction to HCI that acknowledge how much HCI as a field inherently takes on concerns traditionally associated with feminism and invites deeper engagement with these concerns. Despite the feminist implications of its work, HCI as a field has generally remained depoliticized; universality has been the core value of the field for years, and the central concept of the whole field, the "user", still remains genderless. Bardzell describes a feminist HCI characterized by six qualities: pluralism, participation, advocacy/reflexivity, ecology, embodiment, and self-disclosure. These qualities lead to designs that are more human-centered and produce more socially-just impacts, as demonstrated in numerous examples of feminist HCI in action (D'Ignazio et al.2016; Fiesler et al.2016; Dimond et al.2013; Ahmed 2019; Bellini et al.2021; Felice et al.2021; Verma and Dombrowski 2018; Dombrowski et al.2018; Dombrowski et al.2017; Branham and Kane 2015).

Similarly, Catherine D'Ignazio and Lauren Klein offer an alternative vision of data science that centers feminist values and practices that they call data feminism (2020). Data feminism is a "way of thinking about data, both their uses and their limits, that is informed by direct experience, by a commitment to action, and by intersectional feminist thought". Like many of the other approaches named above, data feminism is based around an acknowledgement that power is distributed unequally in the world and an accompanying belief and commitment to co-liberation.

Other scholars have used feminism as a lens to more radically question computing. In "Even When You Are a Solution You are a Problem: An Uncomfortable Reflection on Feminist Data Ethics" (2021), Anna Lauren Hoffmann raises concerns with the ideas of "design justice" and

“data feminism” and other movements that aim to repoliticize computing and center it around Western feminisms or other ideals. She draws attention to the fact that computing has always been political and rooted in colonial ideas, drawing from Black, Indigenous, Latinx, queer, and anti-capitalist perspectives, like the Laboria Cuboniks collective’s xenofeminist manifesto (2014) that urges us to be less “at ease with computation”. Hoffmann proposes refusal, or the practice of *not* being at ease with computation and rather critically questioning the overarching purpose of computing, as a universal feminist value, subverting the dominant algorithmic formalism orientation of universalism. Hoffmann describes this as “not universalist as the elevation of parochial or narrow Western practices as the only relevant pathways to the future...rather, I mean universal as able to cut across cultures, generalizable to the struggles for gender justice regardless of the particular details in particular contexts.” Hoffmann draws on the work the authors of the Feminist Data Manifest-No (2019), which articulates refusal through a series of simultaneous critiques of normative uses of and approaches to data and a generative envisioning of alternative approaches. The Feminist Data Manifest-No uses refusal’s “negative construction” as a “refusal of inheritance” of dominant social and political ideas to allow multiple feminisms to “hang together”. In doing so, the authors create space for a more pluralistic and radical approach to feminist computing. In this critique, Hoffmann and the authors of the Feminist Data Manifest-No do exactly as Angela Davis recommends and “inhabit contradictions and explore what is productive in these contradictions”, enacting a feminist value of epistemic humility.

Their critique and the other models of feminist computing thus illustrate the expansive potential of integrating feminist norms, values, and assumptions in computing.

## Teaching Feminist Computing

Understanding the transformative potential of feminist computing led me to begin questioning why all technologists weren’t feminist technologists. How is the dominant computing culture reinforced and reproduced? How does the institution of computing and engineering education further perpetuate these modes of reasoning?

Scholars have studied the dominant pedagogies within computing and engineering education and have demonstrated how these institutions, like the tech industry, are incredibly de-politicized. Sociologist Erin Cech conducted a 2014 study on four engineering institutions of different sizes and with different characteristics, ranging from standard large public state schools to small, progressive, private schools (including Olin) and observed that across all institutions, undergraduate students grew *less* engaged in the public welfare across their four years. Cech described this as resulting from the culture of disengagement within engineering education, which she theorized as consisting of three pillars: the ideology of depoliticization, which frames any “non-technical” concerns such as public welfare as irrelevant to “real” engineering work (closely mirroring the orientation of internalism); the technical/social dualism, which devalues “social” competencies such as those related to public welfare; and the meritocratic ideology, which frames existing social structures as fair and just (closely mirroring the orientation of objectivity/neutrality).



Other scholars have articulated how the culture of disengagement manifests specifically in computing education. For instance, Deb Raji and others described how current efforts in AI ethics education trend towards “an ‘exclusionary’ pedagogy that further siloes perspectives to challenges from the necessary considerations of other approaches” (Raji et al. 2021), which would further perpetuate the culture of disengagement, and have articulated a need for a more inclusionary pedagogy that values epistemic humility and openness to forms of expertise that lie outside those that are commonly accepted by the discipline. Vakil describes how dominant approaches to computing education implicitly define CS education in service to corporations, the military-industrial complex, and other systems of oppression, and articulates the need for justice-centered approaches to CS education that articulate a clearer, explicitly political vision for CS education (2018).

The culture of disengagement within computing education also contributes to the exclusion of marginalized students in the field of computing. Several scholars have described how by ignoring identity and political values, computing education “ignores processes that shape students’ understanding of computing as an anti-political discipline...[and] ignores power dynamics and privileges that reinforce the matrix of domination and ultimately marginalize Black women as well as Black and Latinx students” (Lin 2022, Rankin et al. 2021, Barton and Tan 2020, Malazita and Resetar 2019, Ryoo et al. 2020, Vakil 2018, Vakil 2020).

Other scholars have described how feminist approaches to computing education could actively challenge the culture of disengagement, in the same way they can challenge the dominant computing culture. In the broader context of engineering education, Donna Riley articulates how a transformative feminist perspective would involve “fighting for representation of all women, as well as men of color and other underrepresented groups in engineering”, addressing the minoritization of marginalized students that is a byproduct of the culture of disengagement, “[and] also raising concerns about engineering’s link to militarism, ecological sustainability, and global economic inequality” (Riley et al. 2009), addressing the key pillars of the culture of disengagement by explicitly repoliticizing engineering.

Scholars have experimented with implementing feminist pedagogy in the classroom. For example, Kevin Lin (2022) described a justice-centered version of a data structures and algorithms course that made “ethics and identity...the center of inquiry” through feminist pedagogical practices like culturally responsive education and valuing of situated knowledges. I experienced the transformative impact of feminist approaches to computing education through PInT, which actively challenges the culture of disengagement through its enacting of feminist values of care, slowness and deliberation, and autonomy (Chowdhary et al. 2020). The context of PInT provided the space for me to productively engage with refusal and develop my feminist values and learn how to integrate them into my computing practice.

There has been some work done into understanding how specific experiences can teach people how to integrate feminist values into their practice. For example, Catherine D’Ignazio and colleagues (2020) studied the Make the Breast Pump Not Suck hackathon, a large-scale

equity-focused breastfeeding hackathon (D'Ignazio et al. 2016), as an example of feminist consciousness-raising. Through interviews with hackathon participations a year after the hackathon, they illustrate that the hackathon functioned as a space of “feminist consciousness raising” by providing space for “navigating and sharing personal experiences, contextualizing and connecting these experiences to structural oppression, and developing participants’ self- and collective-efficacy to create design and policy interventions and enact social change”.

## Research Question

Throughout the literature, I found many inspiring examples of theories of feminism and computing in partnership and examples of other scholars actually trying to live out these theories. I resonated with the calls to action coming from other scholars critiquing computing education. But I didn't find any other stories like mine, of other students who were developing their feminist and professional identities and trying to put them in conversation with one another. As we try to change computing education to be more feminist, we need more evidence to understand the experiences of people going through computing education right now and need to hear their stories to envision how computing education could transform.

Furthermore, the current theories around feminist computing are, for the most part, developed either without direct empirical basis or through surveying or gathering examples. They are also often developed and practiced in contexts like academia or non-profits that are not representative of all of the contexts where we need feminist computing. We need to understand the experiences of early-career undergraduate, who may not enter justice-oriented contexts, who are still figuring out their paths, and exploring how feminism and feminist ideas could fit into this path.

In this study, I sought to find more stories to understand how undergraduate students practice feminist computing and the experiences that could help them develop into feminist technologists.

## Methodology

To construct an understanding of the characteristics and development of feminist technologists, I conducted a small sample in-depth interview-based study that used thematic coding to analyze the data and followed a phenomenological approach throughout in order to account for the positionality of the subjects and researcher. To understand the experience of becoming and being a feminist technologist, I interviewed students who were feminist technologists in training and professionals who were feminist technologists in practice.

## Phenomenology

The design of this study was informed by phenomenology, a qualitative mode of inquiry that seeks to develop a subjective understanding of a phenomenon—not just *what* was experienced,

but also *how* it is experienced (Moustakas 1994). Phenomenology shares many values with feminism; for example, phenomenology challenges the researcher to explicitly acknowledge their positionality and attempt to suspend their assumptions, which makes this methodology a good fit for this study. This study explored the phenomenon of becoming and being a feminist technologist.

Other scholars have used phenomenology to understand professional identity development in various contexts and at various stages. For example, outside of engineering, scholars have used phenomenology to understand the lived experiences of leadership educators (Jenkins 2019) and occupational therapists (Ndaa et al.2022). Phenomenology has also been used to specifically explore aspects of feminist identity development. For example, within the context of higher education, phenomenology has been used to understand how educators develop a critical consciousness (Landreman et al.2007). Within the contexts of engineering and engineering education, phenomenology has been used to understand the development of social justice or feminist identities (Brewer et al.2017, Broido 1997, Huff et al.2015, Yeaman et al.2020) and also to explore women's and racial minorities' experiences within engineering classrooms and the effect of these experiences on their identities as engineers (Beckmon et al.2019, Blaney 2020, Gibbs 2008, Mendez et al.2021, McDonald 2016, Morton and Woodson 2019, Morrissette 2018, Rodriguez et al.2022, Sriram and Diaz 2016, Vasquez 2007). These studies often also used insights from phenomenological inquiry to suggest changes to classrooms or curricula.

## Data Collection

### Research Site

All students were recruited from Olin College of Engineering. Olin College is a small, undergraduate engineering school with 350 students and a mission "to educate the next generation of innovators who want to better the world" [Vision and Mission Statement]. Olin has a hands-on, project-based curriculum that emphasizes collaboration and real-world application of engineering skills. At its founding, Olin made a commitment to include a 50% female gender balance [2013 Impact Report].

Olin is a student-centered and student-directed community. It began with a "partner year" where 30 recent high school graduates spent a year co-creating the curriculum and campus culture alongside their peers, faculty, and staff. In the over twenty years since partner year, Olin has remained committed to a culture of experimentation, collaboration, and care, with feedback systems that encourage faculty to experiment with new courses and students to act as co-designers of their education.

Olin has also always had a commitment to "doing good in the world" [Olin Learning Outcomes], which is operationalized within the student community through a clause in the student body's Honor Code that asks students to "Do Something" [Honor Code] and intervene in harm should they see it, and within the curriculum through courses that provide opportunities for students to

use their skills to create positive change. These courses include Affordable Design and Entrepreneurship (ADE) [Affordable Design and Entrepreneurship (ADE)], a capstone program at Olin in collaboration with Babson and Wellesley where student teams work directly with communities to co-design solutions to systemic issues that these communities face, like mass incarceration, food insecurity, air pollution, and more.

Recently, there have been efforts at Olin to expand opportunities for students to engage with “doing good in the world”. These efforts include PInT [About Us], a project team at Olin that I helped create in 2019, which is focused on creating opportunities for Olin students to learn about how they can use their skills to serve the public interest.

I chose Olin to be the site of this study as it was easily accessible to me and I have a deeper understanding of the curriculum and institution, which provides me more context for understanding these student experiences. Following feminist practice, I wanted to choose a research site that I could personally relate to, especially as I consider myself partially a subject within this study.

Olin has also been studied in the past by other scholars; for instance, Erin Cech included Olin in a study in 2014 on the culture of disengagement within engineering [Cech 2014], finding that even in spite of Olin’s commitments and culture and unique nature, students still became progressively disengaged with the public welfare through their time at Olin. This phenomenon leads me to believe that even in spite of Olin’s unique position, Olin may still face some of the same systemic issues that other institutions face, especially when it comes to teaching a critical engineering practice.

I still acknowledge that I have significant bias being part of the Olin community myself. I discuss the potential impacts of this bias in the Limitations section.

## Recruitment

I recruited two groups of participants: students who self-identified as feminist technologists in training and professionals who self-identified as feminist technologists in practice. I aimed to recruit at least 6 students and at least 3 professionals.

I recruited juniors and seniors from Olin College. Typically, juniors and seniors have had at least one professional experience and many have completed most of their core major classes and developed core competencies in computing. They are also typically making personal commitments about their work through their decisions about their careers.

To recruit students, I sent an email to all juniors and seniors with the criteria below to describe potential feminist technologists:

- Designing, developing, and/or examining technology is core to their work.
- Their goals for their work include using computing to create more socially-just worlds, advocating for justice and equity, prioritizing the voices of the most marginalized stakeholders, or other similar commitments.

These criteria were synthesized from my initial literature review of feminist computing. I intentionally kept these criteria broad to encompass the broad range of who may identify as a feminist technologist. Students who self-identified as feminist technologists based on the criteria I provided filled out an intake survey where I collected information on their gender, race, ethnicity, and prior experience. Though difficult at a small school like Olin, I tried to balance diversity in gender, race, ethnicity, and prior experience. When I noticed lack of representation in one aspect, I sent direct invitations to specific students; for example, initially, men were under-represented in the study, so I sent direct follow-up requests to participate to a few male-identifying students who were involved in similar activities as the other participants or who I thought might fit the criteria. The demographic profiles of the student participants are shown in the table below.

<b>Pseudonym</b>	<b>Gender Identity</b>	<b>Racial Identity</b>	<b>Ethnicity</b>
Serena	Cisgender woman	White	
Avery	Nonbinary/genderqueer	White	Irish, Swedish, Welsh
Rani	Cisgender woman	Asian	Indian
Angela	Cisgender woman	Asian	Chinese
Molly	Cisgender woman	Asian	Filipino American
Karen	Cisgender woman	White	
Jacob	Cisgender man	Hispanic/Latino	Puerto Rican

The students above represent a broad range of majors and years and have a broad range of experiences at Olin. I was not able to represent the complete racial or gender diversity at Olin, however; I discuss the potential impacts of these limitations further in the Limitations section.

To understand the experience of *being* a feminist technologist, I recruited professionals who identified as feminist technologists in practice. I identified people who were at least one year out of college whose work is explicitly feminist or shares feminist values (i.e., people who may work in civic tech or tech for social good spaces). I directly contacted these people with an invitation to participate in the study and applied snowball sampling, asking them to nominate others for interviews as well. As with students, I aimed to balance diversity in gender, race, ethnicity, and experiences. The profiles of these participants are shown in the table below.

Pseudonym	Gender Identity	Racial Identity	Ethnicity
Ananya	Transgender woman	Asian	South Asian
Michael	Cisgender man	White	
Arushi	Cisgender woman	Asian	Indian
Melanie	Cisgender woman	White	

The sample of professionals above covers a good variety of roles and experiences. The sample is not very racially diverse and I was only able to interview one practitioner who was not in academia. These are limitations that I discuss further in the Limitations section.

### Interviews

I conducted semi-structured interviews using the same set of questions for all participants. The interviews consisted primarily of open-ended questions that sought to understand how the participants define their professional identity and how critical experiences in their life, especially their undergraduate education, led them to develop this professional identity, and how they saw feminism fitting into their professional identity (see Appendix X for the full interview protocol). Before collecting data, I received approval for this work by Brandeis University's Institutional Review Board. I obtained informed consent from all interviewees and cleared all quotes and characterizations with interviewees before submission.

### Data Analysis

Prior to analyzing the data collected, I followed phenomenological methods and conducted an *epoche*, or the naming and suspension of my assumptions [Moustakas]. To do this, I reflected on the same questions I posed to participants in my study, detailing my own relationship to feminist computing and the experiences that led me to this research. I then reviewed my reflection with the aim of identifying my positionality, noting the limited nature of my own experiences and the power I do and do not hold. This follows the feminist method of reflexivity and the feminist notion that researchers' positionalities, as well as their relationships to research subjects, shape the knowledge being produced [Brown 2018, England 1994, Katz 1994, Kobayashi 1994, Lykes and Hershberg 2012]. When analyzing the data, I maintained awareness of the aspects of my positionality that might be influencing the way I interpreted the data. After analyzing each interview, I wrote a memo detailing the potential biases that might have influenced my analysis of the interview. After analyzing all interviews, I re-read these memos and re-analyzed each interview, specifically attempting to challenge my biased interpretations.

All interviews were audio-recorded and transcribed. Using the literature on feminist computing and transformative educational experiences, I developed a set of *etic* codes. Then, I followed an

open coding process [CITE], coding each interview and using the language of the participants to describe emergent *emic* codes. Interviews were labeled using the qualitative data analysis software Dedoose [Dedoose]. I grouped these codes into themes and then made connections between themes.

## Positionality Statement

My unique position in the world influences my analysis of the data I collected. I am an Indian, upper middle-class, cisgender, bisexual, non-disabled woman. I immigrated to the United States when I was seven and recently got my green card, but am not a citizen of the United States (yet). I have spent most of my life in the United States in a suburb in Massachusetts that was majority white and Asian and middle and upper middle class. As a woman of color, queer woman, and an immigrant, I have experienced multiple systems of oppression in various facets of my life and my relationship to feminism.

These experiences have led me to reject white feminism, trans-exclusionary radical feminism, and any kinds of feminism that are aligned with capitalism or other racialized systems of oppression. Growing up and witnessing the way that the United States was structured to disadvantage me and my family in some ways and benefit us in others has led me to develop a stance as an intersectional and anti-capitalist feminist. In recent years, after experiences of abuse and during the Black Lives Matter uprisings, I started seriously exploring abolition and transformative justice, which has also drawn me towards anti-carceral feminism.

This is my personal relationship to feminism, influenced by my experiences. Throughout the research process, I sought to remind myself that one's relationship to feminism is deeply personal. This was especially important to me when interacting with participants whose relationships to feminism were different than mine. In these cases, I tried to get curious about where their relationship to feminism came from, though I still struggled to hold potentially contrasting feminisms together. I have turned to other feminist writers to make sense of this; Sara Ahmed (2017) explored this tension and concluded that there is no "right" way to be a feminist, but there are *wrong* ways to be a feminist, and feminisms that are aligned with systems of oppressions are inherently *not* feminist. This is closely aligned with my stance.

I am also a student at Olin College, which is a highly prestigious and selective higher-education institution in the northeastern United States. During my time at Olin, I have engaged with many courses and activities that explore questions central to feminist computing, the most significant being PInT. Through PInT, I have explored my professional responsibility and identity, and broadened my definition of what counts as technology and what technologists should be expected to do. As a student at Olin, I have also had a unique relationship to the institution I am studying, having experienced some of the same courses and activities that the participants in this study describe. I know that how someone encounters an educational experience is highly influenced by their personal values and background, so when asking my participants about their experiences at Olin, I tried, again, to get curious about how their background and values shaped their experience - even if it was completely different to my own experience.

My experiences with PInT and other activities at Olin have led me to develop a justice-centered computing practice that is now central to my professional identity. I am still working on a definition for this practice, but generally, I am committed to not just dismantling systems of oppression but transforming them into systems of care and justice. My approach to computing draws from transformative justice and requires me to practice reflexivity and self-awareness, prioritizing the voices and needs of those who are most directly affected, and take on a systems approach to the work that I do.

Finally, I am also a qualitative researcher in training. The research I have done so far has been in engineering education and critical data studies, which are fields that have explicit justice orientations and embrace subjectivity and resist flawed notions of objectivity. These are also fields that have rich histories of internal conversation and debate, which has helped me develop reflexivity. I am especially grateful to scholars of feminist engineering education like Alice Pawley and Donna Riley, whose work has expanded my understanding of engineering education and has influenced how I experienced my education as I went through it.

## Results and Discussion

In the following sections, I present an overview of the background of each participant, describe five common characteristics/practices that emerged in the way participants approached their work, and two types of common experiences participants had in their journeys of developing into feminist technologists.

### Participants Overview

**Serena:** Serena is a junior studying engineering with a concentration in computing and expressed a passion for using technology to help people. She loves programming but is also excited about engaging with the non-technical aspects of computing as well, especially opportunities to engage with stakeholders and co-design with them. Serena has a chronic illness, which led her to develop an interest in designing technology for accessibility, though she's still unsure if that is the best career path for her, financially or emotionally.

**Avery:** Avery is a senior studying engineering with a concentration in user experience (UX) design. Before Olin, they hadn't ever seen themselves becoming an engineer and had found engineering scary and intimidating and had focused in high school on art and activism within their high school. Then, they took design classes at Olin and developed more confidence as a UX designer. Their confidence was bolstered by an internship they had at an AI software company. Their main goal as a UX designer is to make interfaces as intuitive and easy-to-use as possible so that anyone can encounter the products they design and not be frustrated with them.



**Rani:** Rani is a senior studying engineering with a concentration in human-centered design. To her, the emphasis in her education has been on the “human-centered” part; she loves people, learning about people, and working with people. Rani has experience with and really enjoys teaching (especially teaching kids) and project management and ideally wants a job that allows her to do both. As a teacher, her goal is to make sure that the kids she’s teaching are having fun and enjoying the process of learning. As a project manager, similarly, her goal is to make sure that her teammates are enjoying the work that they are doing and that work is distributed equitably.

**Angela:** Angela is a senior studying engineering with a concentration in urban design, interested in “design, technology, and how technology design can be used to care for people and help communities thrive.” One of her most significant experiences at Olin thus far is an internship she did at “a community organization that uses design and art to demystify public policy and information about the systems that govern urban life to residents” and since that internship, she has continued to work at the organization throughout the school year. Angela has also been a course assistant and student in Olin’s Affordable Design and Entrepreneurship capstone for several years.

**Molly:** Molly is a junior studying engineering with a concentration in design and computing. Molly is still figuring out her path but values reducing harm, prioritizing human and environmental wellbeing, and bringing care for people. So far, Molly has primarily done front-end design work in research contexts, where she had qualms with the design processes. Before Olin, Molly was significantly shaped by her high school education in a program that integrated the arts and humanities and emphasized holistic learning.

**Karen:** Karen is a junior studying engineering with a concentration in computing and an interest in robotics and art. Ideally, Karen would like to work at the intersection of technology and art. So far, she hasn’t had any opportunities to explore these interests, though. She has done research on asteroids and had an internship last summer at a research company working on warehouse automation and ensuring that warehouse robots. Karen first got into computing in middle school at the urging of her parents and developed her interest through her high school robotics team, which also turned out to be a sexist and toxic environment for her, though she has found Olin to be a much better environment.

**Jacob:** Jacob is a senior studying electrical engineering with an interest in biotechnology and specifically “femtech”, or technology for women’s health. He is interested in becoming a tech entrepreneur and developing more sustainable supply chains after a couple experiences that illustrated how violent and exploitative supply chains for technology can be, especially for people of color. He also has an interest in journalism and was part of the leadership for Olin’s multicultural organization for students of color.

**Ananya:** Ananya is a postdoctoral researcher studying the lived experience of nannies on a caretaking service provider app. She studied neuroscience in undergrad and then shifted to technology during grad school. Through her involvement in the grad student union at her grad

school, Ananya developed a more critical perspective of technology through conversations with people in different departments.

**Michael:** Michael is a design researcher at a civic tech organization who is focused on a humane, human-centered, and trauma-informed approach to designing and developing civic technology. He worked as a design consultant for a long time before shifting into social impact work and starting to work at a nonprofit that aims to intervene in the criminal legal system. Then, out of a desire to work more closely with people that are directly impacted by the criminal legal system, Michael shifted to the organization he works at now.

**Arushi:** Arushi is an Olin alum and a designer at a civic tech organization. She has been working in civic tech for a few years now and has a Master's degree in design, and Arushi's work generally focuses on communities who are marginalized (people affected by the criminal legal system, youth in the foster care system, and unhoused people) and who the government has an insane amount of power over. She defines her professional identity as centering around care both in the process and the output.

**Melanie:** Melanie is an Olin alum and a software engineer at a telehealth startup that provides a community of care for kidney disease patients with a focus on empowering patients with more knowledge about their condition, intervening early in the progression of the disease, and providing a personalized care team. Originally, Melanie had planned to go to medical school, but during her time at Olin, realized that she could be more effective developing software to help doctors and scientists. After graduation, she worked at a Big Tech company, which ended up being a very toxic environment for her. She decided to leave the startup and instead join the startup.

## Being Feminist Technologists: Common Characteristics

Through my analysis, I identified five common themes in participants' experiences of practicing feminist computing: care, awareness of power structures, epistemic humility & positionality, systems thinking, and tensions with living out feminist values. Below, I describe each of these themes and discuss how they relate to the models of feminist computing.

### Care

Several participants described a commitment to care as central to their professional identity. They described "care" as an expansive and embodied process that meant treating people, the environment, and the communities they were part of with respect and love.

Molly described the expansiveness of her commitment to care:

*Having a goal that's to serve the climate isn't good enough in a lot of cases, I'm finding. It gets down to not only having that goal but showcasing care for the environment and care for people, not only within the workplace but also in all of your processes, and not*

*just in the technology, but also in the way that you do your work. It's kind of like a means and ends thing.*

Arushi expanded upon this commitment, describing exactly what it looked like to her to embody care:

*My professional identity is very much the same as my personal identity, and my personal identity is one of thinking about how to craft relationships that are based in care, mutual respect, and interdependence, and that's how I see my professional work too. That's both sort of like how I see my one-on-one interactions with individuals at work, thinking about how I can craft a work environment that is based in making sure everyone has what they need to have their needs met, making sure everyone feels safe and secure, and making sure people have meaningful relationships with folks at work. And that's internal to work, but that's also how I approach the things that I work on. I'm making sure that I'm crafting, in my case in the research world, a research plan or a set of questions that really validates people as people, is really caring for them, sees them as full people, and making sure that I'm respecting their experiences, and giving them autonomy.*

Arushi emphasized how her commitment to care was part of both her personal and professional identity, linking her feminist identity to her professional identity. She also articulated how, because this commitment was so deep to her, it framed everything she did, from her personal relationships, to the way she showed up in her workplace, to the actual work that she did. Arushi also emphasized the connection between care and relationships, seeing these as two mutually reinforcing values; because she cares so much about the people she is working with and for, she wants to foster meaningful relationships with them, and because she is in relation to these people, she feels a commitment to care for them.

Avery expressed a commitment to care as an extension of their commitment to social responsibility, linking care to justice, in addition to respect and safety like Arushi and Molly.

*I have a belief that you should treat other people with care and kindness, and I think the physical artifacts you put into the world are extensions of that. I shouldn't be making something that is causing harm because that's just as bad as if I were causing harm. So care is definitely one of my values, and specifically care on the level of social responsibility. I guess I kind of see those are very similar, in that the higher purpose of social responsibility is equal to the care I have for other individual people, and I feel the same emotional intensity about both of them.*

Like Arushi, Avery extended their commitment to care beyond the personal. They described valuing care on an individual level, expressing a fundamental belief in treating other people with care and kindness, but then extended this to a more political and professional commitment, by likening their care for others to their care for society.

The way that Avery operationalizes this care is by investing a lot of effort and detail into the work that they do. They describe one such act of care:

*On the software for the company I'm working at right now, there's one button that tells you the current tool selected. It's a highlighter tool and there are different colors of the highlighter which mean different things, and people would often forget which color they have currently selected. They would know, 'I have the highlighter selected, but I don't know what color it is.' And I actually suggested a very, very simple change which is to change the color of the button to match the color you currently have. And it instantly made people's lives so much easier and when we were on calls with users and stuff, they mentioned, 'oh, I love this little change', totally unprompted. It feels really good to know that I made somebody's life easier and it's not even something you would even think about if you're encountering software for the first time, but I think it's fulfilling to me from a spiritual sense of thinking about the objects that I use in my life and that somebody put a lot of thought and care into crafting this thing, and it makes you feel loved when people put that care into an item that they know you're going to be using, even if they will know who you are or what you're using it for.*

In this case, Avery described wanting to design artifacts that are caring out of a sense of love for the people who would be using these artifacts. Arushi practiced a similar diligence, but connected her commitment to care to a sense of civic duty. She described this when talking about her first technical job in government:

*I had a boss who talked a lot about the importance of the work that we were doing and one of the things she said that I think about a lot was that we have to put all of our care and we have to produce excellent and caring work because the folks that we are talking to, and the folks we are trying to serve, nobody puts that into the types of services and products and experiences they're delivering to them. So we have a responsibility to do what we can to provide this level of care and excellence to folks who otherwise don't get these things.*

*This made me realize the importance of the small decisions, every single small decision we're making in the work. For example, It would be really easy for me to write this report in Times New Roman 12 point double space font for example, but what does it mean to then take the extra 30 minutes to make it really beautiful. And I think a part of that made me realize the commitment of taking that time.*

Arushi also connects her commitment to care to a broader sense of social responsibility, but aims to do more than just avoid causing harm. She aims to care for people through every aspect of her work, turning care into a design principle that governs every aspect of every artifact she creates: in her process for collecting data (as described earlier in her commitment to treat her interview subjects with respect) to the way the data she collects is presented.

Angela also expressed an expansive commitment to care that extends beyond individual relationships. She extended her commitment to care to the communities she was part of. This value became clearer to her in a sustainable design course she took:

*It became so apparent to me what the importance of connecting with your community and doing work that's centered on and connected with the ecologies around you is. And ecologies encompass everything that I want to say, which is the people, so your friends, family, strangers, etc. but also the natural ecology, the environment, the animal, the wildlife, the plants, the air, bodies of water, etc. And I realize I'm kind of a transplant. I'm not from Boston, I'm not from Massachusetts, and so it felt really important to me that I try harder to understand and know this place, because I have come to love it. Part of it is that I want to learn more so I can become a better steward of this place and someone who's better equipped to be an upstanding citizen.*

Angela's commitment to stewardship comes from care for the community that she is part of. Ananya expressed a similar value of being connected to and responsible for the communities that she is part of; when conceptualizing her ideal undergraduate education, she described a desire for a more "responsive curriculum that is actually grappling with what technology is doing, where we live, and who is being dehumanized by the existence of these technologies every day" and a university that interacts with the local community and has a greater student union presence.

## Discussion

Participants' approach to care aligns with and extends on two qualities of feminist HCI (Bardzell 2010): embodiment and ecology.

The attention to *feeling* as part of caring for someone, as in Avery's desire to create artifacts that help people feel loved and Arushi's desire to treat her interview subjects with respect so they feel validated as people, is evidence of the quality of embodiment, and expands our conceptualization of what embodiment in feminist computing looks like. Bardzell's theorization of embodiment in feminist HCI focuses on how design artifacts can attend to embodied experiences, like emotion, fun, and sexuality. However, the participants' approach to care, especially Arushi and Molly's commitment to care in both the output and process of their work, indicates that the quality of embodiment should be a design principle within the process as well as the artifact. This has implications for how we could create workplaces and communities of practice that are also embodiments of care, as Arushi aims to do and as other scholars have explored in feminist hackerspaces (Fox 2015) and feminist living labs (Ahmadi et al.2020).

Participants' approach to care also aligns with the feminist HCI quality of ecology. Molly and Angela show awareness of the broadest possible range of stakeholders that their work can affect and include, considering not only all people but also the environment as stakeholders in their work. Angela's approach to care as stewardship also includes reflexivity, which is critical to the quality of ecology; she notes her position within the community that she cares for as a "transplant". Arushi and Avery also demonstrate the quality of ecology in their awareness of the

broadest possible effects of their work; Avery is especially considerate of the possible harms that their work might produce, and Arushi is aware of how even the smallest decisions she makes can be acts of care for people. For all four of these participants, this awareness of the ecology of their work seems motivated by an internal sense of social or civic responsibility. This validates the necessity of the quality of ecology as a feminist value, connecting it to justice and a vision of more just future.

## Awareness of power structures

A common theme across many participants was an awareness of power structures in the systems that they were intervening in or part of. This included an awareness of the power they did and did not have, how this power related to broader systems of oppression like gender, race, etc, and was often accompanied with a commitment to center those who were most marginalized.

Many participants described awareness of the kinds of power they did and did not hold. For instance, Arushi talked about the power she had as a person with a Master's degree, specifically in being able to "enter into a lot of spaces that a lot of privileged people are also in who have a lot of decision-making power and have a lot of power in general", and noted that the people she is serving do not have access to these spaces. Similarly, Angela talked about having gained skills over her college education as an engineer and how these skills enabled her to have influence over infrastructure and public policy. Other participants acknowledged the privilege and power they had due to their race, gender, and/or socioeconomic status. Karen talked about the privilege she had in being able to choose where she wanted to work and avoid military companies and could afford to take a pay cut if she needed to in order to follow her values. These choices were available to her because she did not bear so much financial responsibility and had financial support from her family. Similarly, Melanie talked about the privilege she had to be able to choose what projects or companies she worked on and live a comfortable lifestyle in an expensive city.

Many participants acknowledged that they were constrained in various ways too, though. This was a common pattern among students especially, as they considered the uncertainty of their futures, which I discuss further in the Tensions with Living out Feminist Values theme. Angela acknowledged that she had power as a designer and engineer, but also described being constrained by being a woman of color and daughter of immigrants living in an unjust system where she needed to prioritize a career that could support her financial needs. Serena described wanting to work in accessible tech or social impact but feeling constrained by needing good healthcare, which felt most accessible to her in Big Tech companies. Avery and Karen both described feeling burnt out by the emotional labor of social impact work and wanting to prioritize their mental health as well. These participants, through their own lived experiences, had gained an awareness of power structures and their own position within these power structures.

Often, this awareness of power structures and positionality was accompanied by a commitment to directly center people who are most marginalized. For instance, Serena valued engaging

stakeholders in every single step of the design process. She described this in the context of an assistive tech hackathon she had participated in her first year, where she and a group of other students connected with a wheelchair user and collaborated with him to design a tool that makes it easier for wheelchair users to learn to pop a wheelie to get onto curbs. In this project, Serena and her team tried to center the wheelchair user, aware that they were not wheelchair users. They tried to learn how to pop wheelies themselves to understand how difficult it was, and during the hackathon, prioritized the perspectives of the wheelchair user they were working with:

*The person we were working with was also very engineering-minded, so he was honestly just like part of our team. He came to Olin one day before the hackathon and already had a prototype of the thing from something hacked together in his garage. We talked about what he wanted us to do, why he chose the current design he had and really tried to understand that, and then prioritized his goals, because he had very large and huge great ideas but we needed to determine what was most important.*

Serena carried forward this intention of centering the most directly impacted to later classes, including ADE, where she was working with community organizers to build a data visualization tool and tried to engage community organizers throughout the entire design process.

Michael and Arushi also centered those that are directly impacted in their work and had explicit commitments to sharing power. This process often necessitated an awareness of power structures and their positionality within these structures. Michael described this when critiquing a past project he worked on at an organization that aimed to open the “black box” of the criminal legal system by collecting more prosecutorial data to increase transparency. This organization worked with progressive prosecutors to create a platform for a prosecutor to share their data with their community to spark conversations about trends within the community. He described the flaws in this design process:

*We were able to pull together a group of community members as an advisory council to the prosecutors and take them through a number of design activities to get a sense of what they want out of this project, and that is that step toward more of a design process. The problem with that was it was kind of like “meet with the community, then go back and do the design stuff and then meet with the community again and then go back and do the design stuff”, rather than coming up with ways to bring the community into the design piece...*

*Already you've got a very technocratic approach to things that that data is going to be a key aspect of this, and to some agree we've also got referencing of certain types of data -- quantitative versus qualitative, or the knowledge that is contained within the prosecutor's systems versus the knowledge that is contained within the community. The other reality is that in order for the organization to get access to that data in any form, it behooves them to work with prosecutors that are interested in sharing with their communities, like progressive prosecutors--or at least prosecutors who believe that that*

*data belongs to their community and they want to share it. The community might be interested in the data, but is that their number one project or what they prefer to see most out of a prosecutor? That's kind of the idea of bringing an idea into a community versus having the community work in conjunction with the prosecutor to address what they see as their primary needs first.*

Michael brought a power analysis to this project where he considered the historical power dynamics between a community and the prosecutor within that community. He observed how this power dynamic can manifest in whose knowledge is considered more or less important, and how he was contributing to this dynamic by choosing to prioritize the knowledge of the prosecutor as opposed to the knowledge of the community. He also described this approach as “technocratic” noting that the valuation of knowledge lined up with tech-solutionism; knowledge that is more “technical” (quantitative data) is valued and preferred over knowledge that is more “non-technical” (qualitative data). His awareness of this power differential led him to stop working at this organization and instead move to a different organization that tried to center the directly impacted in its work. Arushi also works in this organization and described how she tried to share power within this work:

*A lot of sharing power has to do with giving away as many decisions as I can to those that are directly impacted. It's really, really complicated when you're working on policy and when you're working in government, and especially as a non-governmental actor (we're a nonprofit). So we weren't actually making a lot of the decisions, but we were making some of the decisions. We were deciding who to talk to, the types of questions we were going to ask, what we were going to share to our partners in terms of the research that we learned. And one of the things that we did in a lot of these decisions was asking ourselves how we could bring those that are impacted into the conversation. So for example, we did a consultancy where we had folks living with convictions read the entire research plan that we put together and we asked them if these are the types of questions they think are important to uncover, or if there are different ways that we should ask? We would also, after everything was completed, have them read the research reports that were going to be shared to government stakeholders and say, is this what you would want to tell government? Is this how you would want to tell government? And where possible, we would try to allow individuals who were directly impact to share their story themselves if they wanted to.*

Arushi extended upon Serena's practices of including those that are directly impacted in her work by trying to take direction from them and act as amplifiers for their voices wherever possible. The act of sharing power reflects a commitment to going beyond simply being aware of power structures to also dismantling these power structures. Michael also did a consultancy in his work where he hired people living with convictions as consultants, and described how this often meant taking extra time to teach them new skills, like how to craft a research plan. He described this as an act of sharing power, too; the people living with convictions weren't just getting money from the consultancy but also “building this in-depth relationship” where they were brought into the process and allowed to be experts.



## Discussion

Participants' awareness of power structures and co-occurring commitment to challenging those power structures demonstrates the feminist HCI quality of advocacy. Bardzell (2010) describes how enacting this quality requires practitioners to simultaneously commit themselves to challenging power structures while maintaining awareness of their position within these power structures: "On the one hand, feminist interaction design should seek to bring about political emancipation and not just keep up with it. At the same time, it should also force designers to question their own position to assert what an 'improved society' is and how to achieve it." Participants were able to successfully strike this balance, acknowledging the power they had as designers to affect change while centering those who *don't* have that power in their work. Bardzell recommends participatory approaches, like Serena, Michael, and Arushi's practice of sharing power, as a "natural ally to this quality, because they distribute the authority and responsibility for such decisions across a polyvocal dialogue among stakeholders".

Michael's power analysis in the progressive prosecutor data platform project suggests part of "questioning one's own position to assert what an 'improved society' is" is interrogating how power structures are playing out in one's design processes, even participatory processes. Although Michael was engaging in conversation with stakeholders in this project, there were still power dynamics in whose voices were prioritized and which forms of knowledge were valued more. This suggests that the quality of advocacy requires reflexivity like what Claris and Riley (2012) suggest: "reflection upon power relations in the process of reflection (meta-reflection), the particular sociopolitical or sociohistoric contexts under study, the research process and its subjectivities, or epistemic assumptions underlying the work".

This kind of reflexivity creates an opportunity to unearth and challenge the power structures in our own thinking. This could include gendered dualisms (Faulkner 2000). In Michael's case, a gendered dualism at play in his work was the technical/social dualism, which puts technical knowledge (like quantitative data) over social knowledge (like qualitative data). Thus reflecting on our thinking enables us to take on more feminist design processes — both in the way they engage with stakeholders and in the underlying epistemologies.

## Epistemic humility & positionality

A few participants also showed awareness of their (and others) positionality combined with a sense of epistemic humility. Oftentimes, this awareness emerged alongside a value and practice of plurality: seeking multiple perspectives and being able to hold multiple perspectives of the same system or experience at the same time.

For instance, Arushi demonstrated an awareness of the inherent limitations of positionality when describing how she approaches conversations with interviewees for user research:

*I think one of the things you learn and I think just as a person who talks to a lot of different types of people, you learn really quickly that no one is speaking without their positionality, like everyone is speaking from a particular place, and we are kidding*

*ourselves to think that any one person that we talked to is going to give us an accurate account of what's going on because no one has an accurate account of everything that's going on. I think that's really helpful to know because then you come into every conversation really curious about like, okay, how does it actually work for you? Not like, how does the system actually work. It's more like, what are your experiences with it and then how does that paint a different story about how the system is working in practice.*

Arushi emphasized how awareness of her subjects' positionality enabled her to not seek a singular story of how the criminal legal system is functioning but rather understand multiple stories as coexisting together and together providing her a fuller view of the system. She also displayed epistemic humility, acknowledging that she could "never fully understand how the whole system works", not with her position and the tools that she had.

Molly showed similar awareness in the context of designing new tools, considering the fundamental limitedness of any one person's perspective, including her own. She described two research projects where she was conducting user research on and re-designing the front-end for specific tools, one project where she was designing an app to help build indoor maps of spaces to help blind people navigate indoor spaces, and another project where she was creating a tool to help college admissions officers better do their work. In both of these projects, she was primarily working alone. She was only able to interview one person for each project before moving onto the technical development and expressed her discomfort with this process:

*It felt like because I was working alone, there was a lack of diversity in trying to create the tool, and then I was talking to a small group of people on the scale of like one person. The one person I interviewed for the invisible map project was an instructor at a school for people who are blind, and he was a middle-aged white guy who kind of had a good grasp on technology, but that's not the case for everyone. The only college admissions officer we talked to was a woman who was also white, middle-aged, had pretty good tech literacy skills, but I also know that that's not the entire make-up of what college admissions looks like. And within that there was all the ways that she chooses to tell her story, the stories of the applicants, which are different from how other people tell the stories of their applicants. I just saw a lack of diversity on both ends, and I think that's something that's always a red flag to me, because I know that my experiences and my abilities are limited by my understanding of the world, which isn't a bad thing but is a thing I'm aware of.*

Molly also demonstrated an awareness of the limits of any one person's positionality and connected this to an understanding of the harms of trying to generalize any one person's experience, especially when those experiences align with hegemonic norms (white, middle-aged, tech literate). She demonstrated a value of pluralism - not wanting diversity for diversity's sake, but rather wanting diversity as a way to balance the limitations of any one perspective. She further went on to describe how it felt to her like the goal was "more to write a paper than to make a tool", which she felt "lock[ed] us into a specific way of doing things". In the case of the college admissions tool, her professor's area of expertise was information

visualization, so Molly wondered if “he was specifically looking for ways that information visualization could help in college admission” which she thought was a constraining assumption. Her willingness to question the assumption that an information visualization tool specifically could help college admissions officers is a reflection of Molly’s epistemic humility.

Rani also demonstrated a value of epistemic humility and pluralism when describing a digital anthropology class she took last year, which she found incredibly valuable because she was exposed to a “critical lens of technology *not* at Olin.” She described the critical lens of technology at Olin as an “echo chamber where everyone’s like, ‘we’re good, we’re good. No, really, we’re good.’” Rani described how “having an outside perspective where no one was worried about offending anyone in tech was valuable. Everyone was an anthropology major and they were like, ‘yeah, people in tech do all of these things’”, and her classmates also brought an interdisciplinary view, examining tech from a race and gender perspective and considering socioeconomic status and cultural divides. Rani demonstrated epistemic humility in appreciating the opportunity to consider technology from an entirely different perspective than she was used to.

## Discussion

Awareness of positionality and commitment to plurality aligns with the feminist HCI qualities of pluralism and participation. Bardzell describes how pluralism in design “encourages an alternative sensibility to design, foregrounding questions of cultural difference, encouraging a constructive engagement with diversity, and embracing the margins both to be more inclusive and to benefit from the marginal as resources for design solutions” (2010). Molly demonstrated this practice in her critical reflection on the design processes in the research projects she worked on. In this reflection, she specifically emphasized tensions with the normative assumptions that were being baked into the design due to the limited number of perspectives that were incorporated, especially because these perspectives were very privileged (white, middle-aged people who were tech-literate). Molly thus demonstrated a more “constructive engagement with diversity” that emerges from a desire to understand and incorporate other experiences with technology.

Molly also linked this engagement with diversity to an awareness of positionality, demonstrating the quality of participation. Bardzell states that participation depends on “an epistemological position, namely that knowers are *not* substitutable for one another” (2010). Molly’s recognition that her “experiences and...abilities are limited by [her] understanding of the world” demonstrates that she holds this epistemological position. Arushi also demonstrates this position through her awareness that “no one is speaking without their position”. Like Molly, she connects this epistemological position to further participatory processes, committing to leaning into dialogue to understand others’ perspectives. She also connects this position to a value of plurality, committing to growing her understanding of the system by learning how to hold multiple different views of the system. This reflects how the quality of plurality could not only result in designs that are more attuned to cultural differences but also simply better interventions in a system as they emerge from a more holistic understanding of the system.

Bardzell emphasizes that the qualities of pluralism and participation depend on resisting universalism -- the universalism of any one perspective, either cultural or personal. Molly and Rani's approach to epistemic humility and willingness to question the place and fundamental "goodness" or "rightness" of computing and technology reflects that this resistance could be extended to also include resistance to any universal epistemic approach. This opens up space for more critical feminist practices, like critical refusal (Hoffmann 2021). These practices would inherently result in more pluralist and participatory designs; as Hoffmann describes, critical refusal creates space for new paths that reject "violent inheritances" like colonialism, sexism, and other systems of oppression. This would certainly constitute a "constructive engagement with diversity", as Bardzell puts it.

## Systems thinking

Many participants practiced systems thinking as part of their work. They showed awareness of the system they were working in, that the system was intentionally designed, that this intentional design often disadvantaged some people over others (connected to their awareness of power structures), and framed their work in terms of which leverage points they can affect within this system.

Participants' use of systems thinking extended beyond simply technological systems. For example, Avery described activism they did in their high school's Gay Straight Alliance (GSA) club to improve quality of life for trans students:

*I was in our school's GSA and we wanted to make the prom court gender neutral and we picked that as a leverage point for improving the quality of life transgender students at large in the school. You couldn't use the gender-neutral bathroom because the security guards weren't trained right where they thought that only disabled students were allowed to use them, which was not true. It was just a terrible situation for transgender students. Making the prom court gender neutral was way easier to do than removing legal names from course rosters or something so that the substitute teacher doesn't read out the wrong name--there's just a lot of logistical complications for doing something that on the surface seems like it should be pretty straightforward but isn't...and it was a very public indication of support, kind of a public acknowledgement that nonbinary people are real, which might be hollow but also makes people aware of it. And overall, we saw that as a net positive, so I think getting that done in high school was like making a small actionable change to an existing system that had positive impacts. Small change, but it has a big impact.*

Avery practiced systems thinking by analyzing their high school and identifying the most accessible leverage point. Melanie described a similar process of analysis when trying to navigate the constraints of the US healthcare system in their work at a telehealth company. As one of the seven engineers at the company and the senior-most engineer, she had some sway over decisions but was not the main decision maker. As a result, she often had to figure out what she could reasonably do and the accompanying business argument that would incentivize

the main decision makers to agree to that. She described this in the context of avoiding deadnaming trans people on the platform:

*Our site was honestly pretty unusable for folks who don't use the name that is on file with insurance. They could've gotten married, they could've legally changed it, they could have transitioned. We had that exact problem with one patient and we said, you know, that's unacceptable, so we just changed it right then and there and said we're going to do this. We're just going to take the day to fix that and knock it out. And that's the kind of confines in which I operate. If something is doable within a short period of time, I can just do it. For longer term things, I need to figure out how to argue that this aligns with the business objective. Thankfully because I picked to work somewhere that is focused on human health, our literal top outcome is how healthy the people using our tool are, so it's easy to argue in favor of people.*

Like Melanie, Rani also had to navigate the constraints of a system when she was considering applying to the Fulbright program to teach English in South Korea. She debated the ethics of doing this, not wanting to force English on the children she'd be teaching:

*I'm going to another country which to me is very exciting because I want to experience all of their culture, their language, and their values, and throw myself into what is likely very uncomfortable because of change. And then I'm coming in and bringing my little American flag and saying, 'hey, you need to learn English', and the country asks for this, it's like a partnership between the country and the US. But I wonder, 'did the kids in the classroom consent to wanting to learn English?'*

*But then on the flip side, I know that it's not my choice that English is useful. Whether or not I like it, it's not my choice of whether or not it's useful; this country has declared that English is important. So the kids there are going to be learning English, and it's a question of whether I can be helpful, and the thing with Fulbright versus other programs is that Fulbright aims to go to rural towns which do not necessarily have the funding to hire someone from America who's going to charge \$90 an hour to come teach English for an hour over Zoom. It doesn't cost the school anything, so they can reach areas that would be more disadvantaged.*

As Rani became aware of the constraints that she and the kids were under - neither of them had the power to determine whether the kids should or should not learn English - she could use her awareness of power differentials, noting that the kids she would be teaching were more systematically disadvantaged, to decide how to act within the system.

In addition to understanding the constraints that she is working under, Arushi practiced systems thinking to understand how these constraints affect *everyone* in the system, giving her a higher-order understanding of the system. Like Rani, she also faced a value conflict in her work as an abolitionist trying to intervene in the criminal legal system and needing to interview people who were facilitating the very system she sought to dismantle, or were making choices she

disagreed with. She described how she maintained an awareness of the systemic constraints and power differentials that affected everyone she interacted with:

*One of the things you realize as you work in these really complex systems is that the system is hurting the folks that are directly impacted by it, but also tying the hands of all of these other system actors. The court clerks are overworked, understaffed, and don't have the resources they need in order to do their job well. I think that's because the entire system is built on this messed up foundation, which is going to harm everyone that's involved in it, except those in power.*

*For me, it was important to center and hold the people that are living with convictions, the ones who are directly impacted, but then to also recognize that everyone is a complex person and they all have different reasons for doing what they're doing. A lot of times you see folks living with convictions decide to become security guards or decide that they want to become a cop because that is a high-paying job in their community, and it's because they're, like everyone, always bound up by these systems and trying to do what they can in order to meet their basic needs. It's a hard question to sort of balance in your mind and I think a part of it is what I was talking about earlier - in all of these conversations, how can I show up in a way that is respectful and caring and meeting people where they're at so that they don't feel stressed out or further marginalized by the experience of that conversation?*

Arushi was aware that those facilitating the system and those directly impacted by the system were shaped by the same constraints and ultimately had the same goal: trying to get their basic needs met. She used this awareness to deepen her understanding of the flaws of the system as a whole and shape her approach to maintain an awareness of the system itself, and not the people within the system, as flawed.

## Discussion

Participants' application of systems thinking is a realization of the feminist HCI quality of advocacy. To understand how to intervene in a system, participants needed to balance awareness of their position in the system with their overarching vision for where the system should go. This often led them to the kinds of ethical dilemmas that Bardzell described as necessary to advocate through design: "seek[ing] to bring about political emancipation" while also "question[ing] their own position to assert what an 'improved society' is." Engagement with this dilemma was especially apparent in Rani and Arushi's stories of grappling with the constraints of the system and their values. Bardzell suggests participatory approaches as one method for engaging with and resolving this dilemma. Rani and Arushi also used participatory approaches, focusing on centering those who were most disadvantaged by the systems they sought to transform and, in Arushi's case, creating dialogue with these people to expand their understanding of these systems.

## Tensions with Living out Feminist Values

Multiple participants described the tensions in actually living out their feminist values; though they could articulate clear feminist values and their ideal visions, often, due to a number of reasons, participants, especially students, struggled with enacting these values, sometimes even choosing to do things that were clearly in misalignment with their values.

Angela articulated this well in summarizing the biggest question she is still grappling with: “How can I, as a designer, engineer, woman, daughter of immigrants, person of many identities in the world, help make it more just, given that I am also a person living in this unjust world?” Most of the students that I interviewed were thinking about this question in some form. Although Angela had always been very confident in her feminist values, she described moments of tension where she considered whether she should do something “more pragmatic”. For example, though she had been a course assistant for ADE for multiple semesters and she described the course as one of the reasons why she wanted to go to Olin, she considered taking SCOPE (another capstone program where students complete a year-long consulting project for a company) instead. Angela described her “inner girl boss saying, ‘you need to make six figures after you graduate’” as one of the reasons why she considered taking SCOPE instead. She felt constrained by internalized social pressures.

Angela and other students also described internalized social pressures as creating a sense of unease with explicitly calling themselves “feminists” or completely embracing their feminist values. Angela described feeling incredibly proud to call herself a feminist and said, “then I learned to feel shame, so I was kind of afraid of that term for a while”. Other students described similar feelings of shame. Both Serena and Molly hesitated to call themselves feminists because they could hear their dads’ voices in their heads or envisioning their dads making faces, reflecting feelings of internalized misogyny. Serena also talked about how she wouldn’t necessarily have the bandwidth needed to engage in a conversation about feminism. In some situations, “I might want to just leave politics - even though it’s not at all political, but some people will take it as political,” Serena said. Though her feminist values were clear to her, the fact that they may be contentious to others made her hesitant to call herself a feminist technologist. Similarly, Molly described wanting to avoid “push back or not being taken seriously” as one reason why she would not call herself a feminist technologist.

Other students reflected on the challenge of living out their feminist values when they were constrained by such unjust systems. For instance, Serena described how, despite being very interested in accessible technology and ideally wanting to work in accessible technology, she needed to prioritize financial security and a job that could offer the best healthcare benefits, which led her to Big Tech — even though she didn’t necessarily want to work in Big Tech. Similarly, Karen and Avery described wanting to prioritize their mental and emotional needs after experiencing significant burnout.

Professionals did not describe these tensions because they had the privilege of being more settled in their professional lives. Even within their work, professionals were able to negotiate the tensions of trying to transform unjust systems while working within unjust systems. For

example, Arushi described how the work of sharing power often meant moving slowly, so she would push her organization to work more slowly and resist fake deadlines. Similarly, Michael described tensions he felt with his work at his civic tech non-profit, questioning whether he was “taking an inhumane system and just making it a little bit more humane”. However, he was able to make sense of these tensions through engagement with scholars; he cited Mariame Kaba and Donna Haraway as essential in shaping his goals, which he described as, “how can we ease suffering in the moment, knowing that suffering will continue?”

## Discussion

Participants’ experiences with the difficulties of living out their feminist values indicates one of the limitations of theorizations of feminist computing: they are simply theories, and reality often comes with constraints and burdens that make complete realization of these values much easier said than done. Their experiences suggest the need for conceptualizations of feminist computing that create space for the non-ideal. Anna Lauren Hoffmann presents one such conceptualization in her uncomfortable reflection on feminist data ethics (Hoffmann 2021). She raises concerns with any kind of normative stream of feminist computing that does not fundamentally question itself. Hoffmann emphasizes that avoiding a normative definition of feminist computing is, perhaps, essential to truly practicing feminist computing, or more specifically a feminist computing that creates space for Black, queer, Latinx, Indigenous, and other marginalized perspectives. Considering that many participants struggled with these tensions because of positions of marginalization, it feels especially important to create a non-ideal definition of feminist computing.

Sara Ahmed extends this point by suggesting that these tensions are inherent to practicing feminism. She frames living a feminist life as a process:

*Living a feminist life does not mean adopting a set of ideals or norms of conduct, although it might mean asking ethical questions about how to live better in an unjust and unequal world (in a not-feminist and anti-feminist world); how to create relationships with others that are more equal; how to find ways to support those who are not supported or less supported by social systems; how to keep coming up against histories that have become concrete, histories that have become as solid as walls (Ahmed 2017).*

Ahmed’s description of what it takes to live a feminist life is similar to Hoffmann’s, hinging on being able to maintain a sense of productive unease with one’s feminist values and how to practice them.

## Becoming Feminist Technologists: Common Experiences

I noticed two common themes in participants’ descriptions of experiences that significantly shaped their values: lived experiences or directly hearing others’ lived experiences with oppressive or marginalizing power structures, and mentors and communities of practice that modeled feminist values.



## Lived Experiences or Directly Hearing Others' Lived Experiences

For several participants, direct experience with power structures or hearing others' experiences with power structures was transformative and helped them develop feminist values.

As a cisgender white man, Michael had never encountered marginalization like the people he tried to serve. But during his time at the organization working with progressive prosecutors, Michael had a chance to present at a conference in Birmingham, Alabama, hosted by a community organization of formerly incarcerated women and girls. The organization had chosen Birmingham because it was the site of the Equal Justice Initiative's National Lynching Memorial. Michael described the transformative effect of seeing the memorial and then hearing the women's lived experiences within the criminal legal system:

*....[the memorial] is just one of the most powerful symbolic spaces that I have ever been in. And then at the conference, I began understanding the connection between lynching and the modern criminal legal system, and it really focused me. And I was sitting through and talking with people who had been really impacted by the system, either directly or indirectly, and hearing their stories but also hearing their critique of not just the criminal legal system but also a lot of the non-profits that are working to try to improve things, and just like thinking about like, yeah, I'm going to give a talk about how my nonprofit does stuff and you know it's not going to be very useful for the type of activism that you're doing. It jump-started my thinking through what cultural competency really means and was also my first direct encounter with trauma. I don't think I've ever been as intimidated in my life as I was there, appreciating everything and trying to figure out what my position is in this and how do I show up authentically into a space that I've only been partially welcomed into.*

Through the memorial and the conference, Michael was able to acknowledge the person by witnessing and listening to other people's experiences, which was an embodied and emotional experience for him. Through conversation at the conference, he was then able to contextualize this personal understanding within a political system and understood his complicity within that system, working for a non-profit that was ultimately not benefiting these people very much at all. These experiences led him to develop a new vision for how he wanted to intervene in the criminal legal system. Specifically, Michael started to adopt a trauma-informed lens, and he acted in service of this vision by leaving his job at the nonprofit and instead starting a new job at an organization that aims to work directly with people who are directly impacted and work in a trauma-informed way.

For Ananya, her involvement in the grad student union at her graduate school helped her develop feminist values. Entering into her grad program, Ananya described herself as "totally indoctrinated" and described her PhD program as "not critical at all - it was pretty much straight ahead like 'let's make technology'". Her background in research had been in the neuroscience of autism, though she said she "had no frame of either a political or disability justice framework" to understand how ableist this research actually was. She described being generally unaware of power structures both in her work and in the contexts surrounding her work; she described her

initial understanding of her grad school as an “institution that was going to lend me prestige and it’s a place where I can learn and I can be paid to learn as a PhD student and I can have a research fellowship and I can just think and read about things, isn’t that so great.” However, when she joined the union, she was able to directly experience the exploitative nature of power structures and grow a more political understanding. Ananya described how being part of the union gave her direct insight into the exploitative nature of the institution:

*I didn’t have a conception of the university where they would send armed police officers to intimidate us when we were handing out flyers. The cruelty of this institution that I discovered, it was just like, I mean it made me furious. There were so many times where I was just shaking with anger. There was one situation where we actually confronted the president of the university and it was like talking to a robot. It was like someone with such little empathy for what we were saying that it’s like being gaslit you know. You go into a room with high up university officials and you tell them that there was harassment problems, like people are getting abused, because I’ve been in so many meetings where fellow PhD students would be telling us about what was happening and they’d be crying saying that someone in my lab who’s above me did something physically violent towards me and they’d be crying. But you got to the university and they’d be like, no it’s not a problem, we’ve got this handled, we have a process.*

*And I would just get so fucking mad and I had felt mad before in my life, but this was a political anger. There were these power structures that were so hellbent on not letting us do something so simple as having dental insurance. To think about why that was happening, and then read and do more thinking and talking, and understand that it’s not they don’t want to give us dental insurance, it’s that they don’t want to give us the power to demand dental insurance for ourselves, because if they do that, then what else could we ask for? Like, what else could we get if we had the ability to be so organized, to make our demands real, come to fruition, the kind of power we could have. You know, we could demand like way bigger raises, we could demand that they pay for all the health insurance, not just a deductible, or whatever. To have that power analysis was really transformative for me.*

Ananya’s experience in the grad student union made her confront power structures first-hand for the first time. She described being a suburban child and having no political analysis of the police, in addition to having no political analysis of the institution, but this embodied experience that was so emotional for her helped her gain direct awareness of power structures. The grad student, as a community, also offered a space for Ananya to make sense of this; she talked about how it was valuable to talk to the history and sociology students within the major and get exposed to more left-leaning content, which began informing her understanding of these power structures. Gaining a political understanding of the institution also helped her develop a more political understanding of her work too. Ananya’s experience in the union led her to develop a professional commitment to challenge power structures. She described how her experience in the Union directly influenced her center marginalized people in the rest of her work, such as

taking a pro-worker stance in her postdoctoral research analyzing the experiences of nannies on a care-taking service site.

Jacob underwent a similar journey, developing feminist values through a series of experiences that disillusioned him towards the tech industry. Jacob's understanding of power structures began developing through a journalism class he took where he explored the history of the FDA birth control trial. He learned how the FDA exploited Puerto Rican women during the trial, which made him "incredibly emotional", as it connected to his lived experience: he was Puerto Rican, he had lived in a household of women all of his life, living with his single mother, grandmother, and younger sister, and the trial had taken place when his family was still living on the island. The direct connection to his lived experience powerfully shaped Jacob's political understanding of the trial and led him to explore how design processes more broadly can be exploitative. He started exploring how supply chains in embedded electronics can also be exploitative, often in a racialized way. He described the epiphany he had when he was taking a class on micro-controllers:

*I was taking a class on micro-controllers and was very interested in all kinds of hardware projects, which I never got to because I was looking at how cheap the PCBs were that we were ordering for them because we needed to fit them into the budget. I talked to the professor about how they were so cheap and I learned about how disgusting PCB manufacturing is for the first time. And it made me question like, what's the point of doing these projects? I was trying to make a device that could connect multiple Bluetooth speakers so you could have surround sound with just Bluetooth speakers. And I was diving into it and trying to learn about it and I just couldn't order anything and I didn't want to order anything because I knew I'd be a consumer to this very terrible industry. And then I came to the conclusion that that's all electrical engineering really is: it's just being a consumer to this terrible industry. The way we do it, I feel like maker culture is very consumerist.*

Jacob expanded his growing political understanding of the exploitative nature of supply chains to the embedded electronics industry as a whole. This understanding deepened when he interned at a major biotech company and had first-hand experience with the exploitative power structures within the embedded electronics industry. For example, after learning about conflict minerals, he refused to use minerals like tantalum in any of his testing set-ups. Yet, he described how he heard engineers at this company talking about how great tantalum was, even though they knew the tantalum was mined by child soldiers. He also described the racist internal structure of the company, where "anyone that looked like [him] was on the cleaning staff" and all of the engineers came from privileged backgrounds, and described racial microaggressions he experienced while at the company. This racist internal structure mirrored the company's business decisions; Jacob described how the company only prioritized work in lucrative areas like men's health, despite having products that he described as "mind-blowingly awesome and could change the way we look at cancer in general".

Jacob's direct lived experience with these power structures and growing political understanding of these structures led him to start to make explicit political professional commitments. Jacob developed a commitment to becoming a tech entrepreneur and building more sustainable supply chains that directly challenged these power structures. When talking about potential technologies that could create a positive impact, Jacob expressed his view of the system as fundamentally flawed and illustrated his alternative vision:

*When I connect it to an actual industry and think of it within the real world, I think it would become problematic, simply because the supply chain is built upon who's actually going to have access to it. I see a lot of times where tech is a solution, and there's a lot of like, "but wait, someone can benefit from this in a good way!" But at the same time, if it's not the person I want to benefit, then I don't really care. Honestly, the conclusion I came to, and this is kinda rough, is that my goal going into the professional world is to take as much money from the whole white ruling class as I can and funnel it down as much as possible.*

Other participants described how the pandemic and other experiences in the world made them further aware of power structures and deepened their feminist commitments. For example, Arushi described how doing research with people most marginalized by and most impacted by the pandemic reaffirmed her commitment to and the importance of the work she was doing. Similarly, Jacob described how observing the Black Lives Matter protests in response to the murder of George Floyd contributed to his growing awareness of power structures, leading him to question whether it was ethical for him to be part of the leadership of the multicultural student org at Olin, or if he should step back to create space for others, especially as he recognized his privilege in growing up as a light-skinned man who could pass as white. This is another example of Jacob acknowledging his personal lived experience and understanding his position within the system. He ultimately decided that he could be part of leadership if he focused on uplifting other Hispanic engineers and not trying to make decisions for anyone else, furthering his commitment to dismantling power structures.

## Discussion

These stories are examples of feminist consciousness-raising and demonstrate the power of lived experience. Consciousness-raising was a mass organizing tool used by second-wave feminists in the 1960s and 1970s to turn their personal lived experiences into the basis for collective political action. D'Ignazio and colleagues devised a model of feminist consciousness-raising (2020) based on the *Combahee River Collective Statement* (1975) and other Black Feminist scholars (Kaba et al.2017). Their model consists of three stages:

- 1) the **personal**, which begins with an acknowledgement of personal lived experience, either by experiencing power structures directly, or by witnessing or hearing others' experiences of these power structures,
- 2) followed by **growing towards the political**, which includes conversation with others and a process of identifying patterns of structural patterns and making sense of these experiences within larger systems

- 3) concluding with the **political**, where people begin constructing a more just political vision and taking steps towards this vision.

Michael, Ananya, and Jacob's stories closely match this model. They all begin with a powerful, emotional encounter with power structures — either directly, like in Ananya and Jacob's cases, or indirectly, as in Michael's case. Sometimes, this was a singular experience, as in Michael's case, but often, it was a set of multiple experiences that started to constitute a pattern that further exposed the underlying power structures. Then, they describe a phase of making sense of these direct experiences by understanding the power structures they encountered and their position within these power structures, often through internal reflection and/or conversation with others, but also through experiences that allow them to “test” their hypotheses, as Jacob described his internship as an opportunity to test his hypothesis that maker culture was inherently consumerist. Finally, all three participants describe making intentional and political commitments as a result of this deeper political understanding. Their experiences suggest that experiences that center lived experience and intentionally discuss equity can be powerful experiences for people on their journeys towards becoming feminist technologists.

## Mentors and Communities of Practice

Other participants developed feminist values through experiences that modeled feminist values and offered an environment where they could explore and deepen their feminist values.

Some participants had relationships with mentors who modeled feminist values. For instance, Arushi described how her boss at her first technical job out of college emphasized the importance of care to her. Specifically, her boss framed the importance of this care within the context of power structures, emphasizing how the people Arushi was serving were systematically denied this care. This framing led to Arushi adopting care as a design principle and overarching professional commitment. Similarly, Molly learned the value of care from a professor who acted as an early mentor for her. Her professor described the hierarchical valuation of different kinds of work like care work and modeled an explicit value and honoring of care work. She told Molly that “[t]here are certain kinds of work that will never be done, that you can't walk away from entirely. Caring for someone, caring for your community is a piece of work that's never going to end.” Molly described returning to this statement often and that it helped her develop a commitment to care in every aspect of her work.

Melanie had mentors who modeled feminist behavior for her at her first job out of college, within the context of a very misogynistic and anti-feminist company. She had two mentors who were more senior-level and created networks to support Melanie and other young women working at the company; these mentors helped Melanie navigate the power structures of the company and modeled feminist mentorship, which led to Melanie taking on that role at her next workplace as a feminist workplace organizer.

In all of these experiences, having a personal relationship to feminist role models helped participants develop awareness of the power structures they were part of and understand how they could challenge these power structures.

Other participants were part of communities that similarly modeled feminist values. For instance, Angela was significantly influenced by her colleagues at the nonprofit she interned at and the students in ADE when she was a course assistant for the program. She highlighted the value of being around other people who were asking similar questions to her like “how can we make things more equitable and how can we best serve the community that we are lucky to call home?” and who brought so much intentionality to their work.

These experiences were not necessarily significant because of the work she was doing; Angela described the work as “grunt work”: updating spreadsheets, transcribing notes, and making social media posts. But this work happened in the context of a community that felt aligned with her and shared her feminist values, like civic responsibility and care, and even offered her opportunities to *practice* these values. Angela described embracing the grunt work as an act of caring for these communities, even wanting to keep working at the nonprofit for free because she cared so much about the work that they were doing.

Molly had a similar experience in an interdisciplinary arts and humanities program in her high school that modeled feminist values and gave her the chance to develop her own values. She described the experience as “truly transformative” -- in her words, she would be a “completely different person” without the program. She described the transformative shift she experienced through the program:

*The program completely changed my value system, if I'm being honest. It completely changed how I valued myself and how I valued work and what I saw as work or worthwhile. Before the program, I was a textbook A-plus student; I was very studious, I was very good at playing the game that it felt like high school was sometimes. I could do tests, I could do grades, I could memorize things really well. But I never really thought critically about any of the things I was doing, and I don't think I ever put any of what I was learning in any sort of larger context outside of the class. The program really supported me in doing that. It was really focused on student-directed learning so everything you did was something you chose to do. Obviously they had prompts for things, but like, the big cornerstone of the program was this big project where you spent the first semester doing research on some topic of your interest, and the second semester you acted on that, and created some sort of action in the world.*

*I had never really thought about my position in the world prior to that; I think that my family was very insular, and so was my high school. So the component of going out into your community and doing something was really different from anything I had ever done. They also really valued community and feeling safe around each other. In addition to the things you would regularly do in a classroom, there were check-ins at the beginning of each day, we played games like hacky-sack to start class, sometimes we had meditation halfway through, and we'd bring snacks. Sometimes we had show and tell.*

The program Molly described clearly demonstrated feminist values of autonomy, care, community, and advocacy. Molly emphasized how its transformative nature was only enabled by it being a truly safe community where she could begin to challenge her deeply rooted beliefs:

*I think I romanticize the experience. It was very different from how I describe it now because going through it was very painful for me, especially because it was really digging in to questions like, how did I value myself as a person, and what work did I actually want to do, and what happens when all of my other metrics of success sort of fall away, what's left? So the experience of going through that was very painful. There were times I didn't show up to school, I became very depressed during that time. I think looking back on it now, it was very necessary and I'm very grateful to have had that experience, because at the end of the day, it was a very safe learning community to question these things.*

## Discussion

Feminist mentors and communities of practice are shown in the literature to be effective in helping people develop into feminist technologists. Scholars have described how feminist co-mentoring, or non-hierarchical, collaborative relationships where participants learn from one another and share knowledge can help empower marginalized people and increase their feelings of belonging (Goodbee and Novotny 2013). Molly and Angela experienced feminist co-mentoring through the communities they were part of. Their experiences suggest that feminist co-mentoring can lead to more than just inclusion, but also help people develop feminist values like care.

# Putting it all Together

## Implications

From this research, I concluded two main implications: 1) there is not one definite model of being a feminist technologist, and in fact, being a feminist technologist might necessitate continuously becoming, and 2) the experience of becoming a feminist technologist is always deeply personal and emotional and requires a safe community.

## Continuously becoming

Each of the characteristics identified as common characteristics of feminist technologists corroborated and extended upon existing models of feminist computing, like feminist HCI. However, these characteristics did not represent the entirety of being a feminist technologist. One important and unexpected insight was the theme of tensions with living out feminist values, especially for students who are often constrained by the very injustices that they are trying to combat. This suggests that models of feminist computing are inherently limited in their applicability, and suggests the need for models of feminist computing that allow space for tensions to be part of the model. Anna Lauren Hoffman's description of refusal as a universal feminist value, but not a parochial or reductive value, is one such example, particularly in her

definition of refusal as a process of questioning and resisting inheritances and instead choosing other values.

This also leads to another major insight from the research. Though I have claimed to explore the experience of becoming and being a feminist technologist, my framing implies that these are two different states, that one can arrive at a state where they could be *done* becoming a feminist technologist. However, the need for models of feminist computing that embrace the non-ideal implies a similar need for models of development that embrace the non-ideal. In *Living a Feminist Life*, Sara Ahmed (2017) suggests that “to be a feminist is to stay a student”, articulating that being a feminist technologist hinges upon continuously becoming a feminist technologist, and continuously engaging with questions.

Our current models of teaching ethical computing do not create space for “continuous becoming” as the ultimate goal, though. Fiesler and colleagues (2020) conducted an analysis of syllabi of tech ethics classes and identified that most tech ethics courses focus on “teach[ing] student to recognize ethical issues in the world” and some include a practical component of “teaching students to apply philosophical frameworks, legal rules, or codes of ethics to specific fact patterns and situations”, while others might “take the ‘critique’ outcome a step forward towards turning critiques into solutions”. Fiesler’s analysis indicates that tech ethics courses generally operationalize models (like legal rules or codes of ethics) that do not necessarily create space for the non-ideal or reflexivity. Raji and colleagues (2021) further articulate one of the effects of these approaches as “a loss of values, assumptions, and methods that are critical in [humanities and social sciences]: hermeneutical, interpretive, and qualitative methodologies and a sustained reflection on emancipatory societal goals”. By framing ethical computing curricula around “solving problems ethically”, mainstream approaches do not leave space for the kinds of interrogation that are necessary for the “continuous becoming” that is so crucial to being a feminist technologist.

Taken together, these insights indicate a need for educational experiences that create space for the non-ideal and the tensions with being a feminist technologist. This could look like explicit discussion of the tensions that may arise in choosing careers that align with one’s values or concrete case studies that allow students to practice digging into the reality of intervening in complex systems.

### Safety as a prerequisite for developing into a feminist technologist

This research identified two common types of experiences that were influential for participants in their journeys to becoming feminist technologists: experiences that fostered feminist consciousness-raising, which I will refer to as “anti-feminist” experiences in that they often were not feminist in nature and modeled anti-feminist values; and experiences that modeled feminist values, which I will refer to as “feminist” experiences. These anti-feminist experiences were often traumatic to some degree for people or brought to light failures they were either witnessing or taking part in, and nearly always raised intense emotions for participants -- in fact, the emotions were necessary to activate the process of feminist consciousness-raising. Similarly, even the feminist experiences often brought up intense emotions for participants (like Molly).



This suggests that the process of becoming a feminist technologist involves significant emotional work.

Though one of the goals of this study was to identify characteristics of common experiences that help develop people into feminist technologists, these insights lead me to believe that perhaps the most important characteristic may be emotional safety. This was especially beneficial to participants like Molly, even in their feminist experiences that were not so triggering like the anti-feminist experiences. D'Ignazio and colleagues identified a few other characteristics that could foster feminist consciousness-raising, like sharing and valuing personal stories, intentionally structuring equity, and creating avenues for structural literacy. These characteristics could also contribute to an environment of safety.

## Limitations

Some of the limitations of this study are due to the size and lack of diversity in the sample. The sample consists of mostly cisgender women. This may have resulted from my recruitment process; I heard from some peers who were men or nonbinary/genderqueer people that they hadn't thought they were eligible because they did not identify as female and conflated feminist with female. I tried to mitigate this by directly reaching out to some people of the under-represented genders but still was only able to speak to a few non-female-identifying people. Also, the sample lacks racial diversity; notably, most participants are either white or Asian. This is not unusual given that the populations I was drawing from are mostly white or Asian; Olin is a predominantly white institution and white and Asian people are over-represented in tech-related fields. Regardless, this research is missing the perspectives of more Black, Indigenous, or Latinx people.

In addition, of the professionals I interviewed, only one was not a researcher or designer with an advanced degree. As a result, the insights from professionals' experience are limited to one specific context (academic researcher in non-profit or academic contexts). Half of the professionals were also Olin alums, which at times made it easier to link between students and professionals, but makes it difficult to generalize their insights. I believe that some of these issues result from my sampling process relying on participants self-selecting into the sample. As a result, the sample does not necessarily encompass the perspectives of all feminist technologists.

Finally, though I intended to engage my participants in a participatory process and hear their feedback on my understanding of their experiences, I ran out of time. As a result, my insights from my research are informed only by my own perspectives, though I tried my best to mitigate my personal bias.

## Conclusion

I have described the results of a qualitative study that set out to understand the experience of being and becoming a feminist technologist. Through interviews with seven students and four participants and analysis with existing models of feminist computing, I concluded that being and

becoming a feminist technologist may actually be one and the same, and that there is a need for models of development that embrace “continuous becoming” and engage with the non-ideal. In addition, I concluded that becoming a feminist technologist often involves significant emotional work because it’s such a personal experience, and thereby requires an environment of safety. I have had the fortune of experiencing elements of this during my time at Olin through PInT, the project team in which I encountered the most transformative experience on my personal journey of becoming a feminist technologist. PInT, as I and my other co-founders described in our 2020 paper (Chowdhary et al.2020), models feminist values of care and liberation. In particular, because of PInT’s focus on holistic development, care and community, and autonomy, it offered a safe space where I could process all of the emotions that arose for me as my team deliberated refusal and where our refusal was ultimately met with pride and celebration rather than shunning or dismissal. PInT is not perfect and certainly not the only type of experience that could help develop feminist technologists. But it gives me hope for the promise of feminist qualities in shaping computing education towards an environment that can foster the development of feminist technologists.

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