



The Complexity of Nonbinary Gender Inclusion in Engineering Culture

Ms. Andrea Haverkamp, Oregon State University

Andrea Haverkamp is a doctoral student in the Environmental Engineering department at Oregon State University and a member of the editorial board at the International Journal of Engineering, Social Justice, and Peace. She is also pursuing a Queer Studies Ph.D. minor within the department of Women, Gender, and Sexuality Studies. Andrea's research interests include marginalized experiences in engineering, feminist research methodologies, and interdisciplinary environmental justice activism. Her dissertation research project is funded by a recently awarded NSF grant to study the nuanced gender dynamics in engineering education informed by queer theory and collaborative community ethnography. She may be contacted at haverkaa@oregonstate.edu

The Complexity of Nonbinary Gender Inclusion in Engineering Culture

Abstract

Gender in engineering is a long-standing source of inquiry, research, outreach, and discussion as inequity in demographics and negative experiences persist in the field. Women consist of just approximately 20% of our engineering undergraduate programs nationally, and roughly 14% of our national professional workforce. Absent from these numbers and research into gender minority experiences are students who lay further on the margins of discussion, awareness, inclusion, and acknowledgement of existence - students who identify as nonbinary or other genders aside from man or woman. This paper presents background literature on gender, gender minority experiences in higher education, nonbinary gender identity, and aims to present points of discussion to facilitate further engagement with a more nuanced understanding of gender in engineering.

Gender as a social system is defined by multiplicity and fluidity and does not fit within two unitary and discrete categories. The majority of current gender in engineering scholarship utilizes a conceptualization of gender which does not acknowledge or incorporate more than two gender options, and is rooted in increasingly rejected notions of biological essentialism. Nonbinary and gender nonconforming students, some of which also identify within the transgender population, exist in liminal spaces throughout society and higher education, and continuation of this scholarship tacitly denies their existence by framing gender as intrinsically linked to two biological categories. Engineering professionals, faculty, and students who identify as neither men nor women must be included and our conversation be expanded for academically rigorous investigation into gender dynamics and create inclusive engineering spaces.

Conversations around gender neutral bathrooms are just the beginnings of widespread cultural change to support gender expansive engineers. The discipline must re-think our approaches towards gender equity in engineering and the theoretical conceptualization of gender to not only frame its inequity through the sharp underrepresentation of women, but its gender dynamics as experienced by nonbinary and gender nonconforming students. We must continue to make space for marginalized gender identities and gendered experiences. Through reviewing existing literature and integrating my own intimate experiences I seek to discuss preliminary efforts towards nonbinary inclusion in our teaching, professionalization, and language. This paper represents a point of entry for discussing nonbinary inclusion as part of the discipline's continued commitment to cultural change surrounding gender.

Gender in Engineering

Engineering has been described as a hegemonic, masculine culture [1]. Societal and interpersonal gender dynamics, a lack of role models, and lack of community in the field can cause women to alter their gender presentation and sense of self or to leave 'feminine traits' at the door in order to fit in [2]. It has also been documented that women in engineering experience a slower development of engineering identity and a diminished sense of belonging [3]. LGBTQ+ people in STEM have reported similar experiences, including a rate of closeting that is double the

national average for all LGBTQ+ persons, and report higher levels of harassment and discrimination than their ‘straight’ peers [4]. While the marginalization and disproportionate lack of access to STEM education and practice experienced by women and the broad LGBTQ+ community is well documented, the experiences of transgender, gender nonconforming, and nonbinary students are glaringly absent from ongoing discussions of equity and social justice in engineering education. Studies and research into the LGBTQ+ population predominantly circle around sexual identities (lesbian, gay, bisexual) due to the transgender population having a smaller representation in the LGBTQ+ community as well as being a lived experience surrounding gender, not sexuality. This is particularly problematic because the research which exists regarding this community’s experiences in society reveal widespread financial marginalization, harassment and assault, and systemic oppression at levels significantly above the “average” presented in studies of the broader LGBTQ+ community [5].

The framing of engineering as ‘masculine’ and women as inherently ‘feminine’ subtly situates women as not well suited for engineering. The usage of the word sex instead of gender doubly so – by insinuating to many that there are deep biological differences in cognition or ability which limit women’s potential. This ‘female lack’ permeates society, despite little valid research indicating otherwise. This results in a culture with a pervasive framing of gender a way that serves against women’s inclusion. Sociologist Allison Phipps analyzed dominant discourse around women in engineering and described it as existing within a ‘black box’ – seemingly untouched and unengaged with feminist theories and social science research on gender that has been developed since the 1980s [6]. She put forth that the binary language and framing of “Women in Science, Technology, and Engineering” efforts to be working against its intended goal:

“While purporting to liberate girls and women from gender stereotypes and promoting their equality in SET, initiatives which mobilize ‘Women in SET’ discourse may actually be engaged in processes of regulation which reinforce those stereotypes and construct girls/women and SET in such a way as to make it difficult for girls and women to understand themselves as being capable SET students and future professionals.”

Such binary discourse is noted as a source of marginalization for gender nonconforming, nonbinary, and transgender students [7]. The persistent framing of programs, outreach, summer camps, and research in this manner underscore the lack of modernity within dominant gender discussions in engineering and a failure to conceptualize the nuances of gender at the onset. Indeed, the unitary notion of women with intrinsic lacking in their ability to perform rational thought and technical skills serves to “pathologize and girls and normalize masculinity” while leaving out structures of power (i.e. gender conformity, race, class, gender stereotypes, binary discourse, culture) which are the sources of gender inequity. [6] We know that there are not discrete unitary binary categories between high and low pressures, hot or cold, solid phase and liquid phase, or black and white. The same is true for the inaccuracy of conceptualizing discrete and unitary binary gender identities. Gender is more complex than two checkboxes and deserves to be understood and studied with rigor acknowledging this complexity.

We do not have engineering education literature which engages in how these dynamics may affect and impact underrepresented genders aside from women, which necessitates a discussion

around our framing of gender itself. This is necessary to break open our ‘black box’ surrounding gender and begin to embrace multi-disciplinary approaches, theories, and insight, while unsettling assumptions of accuracy or objectivity within our existing body of research.

Conceptualization of Gender

The embedded logics of a professional institution or culture is adopted by those who identify with that institution or culture [8]. With the highly gendered field of engineering, this includes the conceptualization of gender and its corresponding logics. Discussions around gender in engineering often reflect one particular conceptualization of gender which is often termed biological essentialism, or binary gender essentialism. This view of gender posits that perceived secondary sex characteristics form the basis of gender, and that sex and gender can be used interchangeably as they are believed to be the same [9]. Research and demographics which reflect this conceptualization offer gender as two categories to choose from. Within this view behaviors, presentations, and roles are inextricably linked to body parts and there are no socially-recognizable intermediate sexes, and thus no intermediate genders. Under this view, nonbinary, genderfluid, genderqueer, or other gender identities are perceived as not rooted in biology, thus nonexistent, else they uproot the fundamentals of gender essentialism. This becomes a source of tension for the families of nonbinary, transgender, and gender nonconforming children and their peers [10].

This conceptual understanding may appear in mainstream popular culture, but it is far from mainstream in academic fields such as psychology, women’s studies, gender studies, queer studies, sexuality studies, sociology, cultural anthropology, and other disciplines. Broadly, “gender” refers to the behaviors, roles, stereotypes, self-identification, presentations, and actions that are socially attributed to the categories of man and woman [11]. Gender is a system of socially constructed categories – behaviors and bodily presentations are witnessed by others and gender is then ascribed upon them. Witnessing and affirmation by others is what creates the social recognition of our gender [12]. Gender perceptions of femininity or masculinity in everyday interactions do not involve the perception, witnessing, or display of intimate body parts - this is one of the principle theoretical underpinnings which delineates physical sex characteristics from one’s gender identity. The multiplicity and fluidity of gendered experiences across human cultures globally and historically (as well as locally) inform the modern conceptualization that gender is not binary or unitary, and that the essentialist model does not fit the lived experience and intrinsic inclinations of many individuals [13]. People who are outside of the gender binary may identify themselves as any number of “nonbinary” genders or live as a gender nonconforming man or woman, not conforming to presentation, behavior, or gender roles ascribed upon their body. This impacts the perception and recognition of their gender and blurs the line between a valid gender and an unintelligible gender presentation. The social construction of gender does not mean it is not real – for example - traffic lights are a social construct. This does not mean they are not real. It means our understanding, relation, and perception of traffic lights are constructed through the surrounding social discourse and are understood contextually within that discourse. This contextualized discourse can be specific to a historic era, our racial or ethnic culture, a religious context, our communities of sexuality, dominant national or professional culture, etc. This is what creates our culturally specific yet individually differing understanding of traffic lights. Red, yellow, green, the placement above the road, the order and

pattern of the lights, and our adherence to traffic lights are socially constructed. We internalize it and treat it as natural. Like traffic lights, for each of us gender is understood based on the discourse surrounding gender in our lives. This informs our individual and societal understandings, despite how it may feel ‘biologically natural’ or objective.

Scholars do not assert a singular definitive theorization of gender due to this socially contextualized understanding. Most broadly describe gender as a social system of regulated norms as well as our own internal intrinsic inclinations which become gendered. This regulation is invisible yet is what gives gender its pervasive structure in our cultural landscape. Judith Butler states that “gender is the repeated stylization of the body, a set of repeated acts within a highly rigid regulatory frame that congeal over time to produce the appearance of substance, of a natural sort of being” [14]. This regulatory frame creates gender norms that dictate appropriate, acceptable, or otherwise socially dominant behavior which we begin to internalize as early as 31 months old [15].

When buttressing up against these norms you may be questioned, made to feel questionable, made to feel like you do not belong in the space where you are inhabiting, or made to find it too uncomfortable to stay [16]. The social construction and regulation of gender creates the invisibility of those whose expression and identity exist outside of the dominant binary. In turn, the very conditions for those individuals to exist requires this regulation to be eased or removed. Judith Butler explains this phenomenon [17]:

“...individuals rely on institutions of social support in order to exercise self-determination with respect to what body and what gender to have and maintain, so that self-determination becomes a plausible concept only in the context of a social world that supports and enables that exercise of agency. Conversely (and as a consequence), it turns out that changing the institutions by which humanly viable choice is established and maintained is a prerequisite for the exercise of self-determination. In this sense, individual agency is bound up with social critique and social transformation. One only determines “one’s own” sense of gender to the extent that social norms exist that support and enable that act of claiming gender for oneself. One is dependent on this “outside” to lay claim to what is one’s own.

The social context of the engineering discipline is the institutional backdrop for which nonbinary, transgender, and gender nonconforming students may or may not be given the social ability to exist because they are only able to exist within institutions of social support. Without institutions of social support, the ability to self-determine gender is absent and engineering becomes an inhospitable – an impossible – field to be authentic within. It is with this that I call into discussion inclusivity of nonbinary gender individuals and those who have gender diverse presentations in the engineering discipline.

Gender Expansive Language & Definitions

The language around gender diversity is rich with depth, history, and cultural context. I have adapted a condensed list of gender expansive terms from Brielle Harbin below, in addition to adding a few items and slight modifications [18]. This list may be a valuable resource throughout this paper and in our efforts to further understand the complexity of gender.

Cisgender: a person whose gender identity and gender assigned at birth align (e.g. a man whose gender was assigned male at birth based on external characteristics).

Gender Binary: a term that refers to the idea that there are only two genders (e.g. man/woman) and individuals should be gendered as either man or woman.

Gender Expression: a term that refers to individuals' external display of their gender either through clothing, demeanor, social behavior and other factors. Also referred to as gender presentation.

Gender Fluid: a term that is used to refer to individuals who identify in a way that flows between genders, or whose gender identity fluctuates or shifts. This shift may flow between all genders or any subset of genders.

Gender Identity: an individuals' internal sense of themselves as either male, female, both or neither.

Gender Non-Conforming: a person whose gender presentation does not align with socially-constructed gender expectations.

Gender Normative: a person whose gender expression aligns with socially-constructed gender expectations.

Misgender: a term used to describe the act of failing to acknowledge (or use) an individual's requested gender pronouns or using gendered language when referring to them (i.e. ma'am, sir, guy, girl, etc.). The possibility of being misgendered is often anxiety provoking for gender non-conforming individuals. Moreover, being misgendered is disrespectful and violent, putting the misgendered individual at risk for discrimination.

Mx: a gender neutral honorific alternative to Mr., Mrs., and Ms. Used by some who do not identify as man or woman. Pronounced miks or muks. For examples visit <https://en.oxforddictionaries.com/definition/mx>

Name-in-use: The name a person uses which may not be the same as the legal name utilized in governmental and other administrative systems. "I know my legal name on the roster is Lilly, but my name-in-use is Gazlene."

Nonbinary: a term used to describe individuals who do not identify within the man/woman gender binary. Individuals may use this term to describe their gender identity, or it may be used as an umbrella term for genders which are not man or woman.

Pronoun: The gendered shorthand term which refers to an individual in our language instead of name. It includes subjects, objects, possessive adjectives, and reflexive

pronouns. For a list of common pronouns and their usage visit <http://web.mit.edu/trans/GenderNeutralPronouns.pdf>

Transgender: a person whose gender identity and gender assigned at birth align (e.g. a man whose gender was assigned male at birth based on external characteristics).

TGNC: acronym which stands for transgender and gender nonconforming.

They/Them/Theirs: gender neutral pronouns that are preferred by some individuals who identify as nonbinary or otherwise gender non-conforming. Also used to refer to a person or group of unspecified gender. Example – “Where did Alex go, I have their pencil. I hope to see them in class. They are such a nice person. ”

Ze/Hir/Hirs: gender neutral pronouns that are preferred by some individuals who identify as nonbinary or otherwise gender non-conforming. Pronounced zee / here / heres. Example – “Hir name is Sam, and ze is an industrial engineer. I believe this project is hirs to manage.”

Gender, Engineering, & Identity

The number of women working in engineering is roughly 14% of the total professional workforce [19]. Additionally, 20% of those enrolled in engineering undergraduate programs identify as women [20]. This makes engineering by many metrics the most gender imbalanced discipline in the United States. Alongside these male dominated statistics are an engineering culture which is hegemonically masculine and more welcoming towards men [21]. The small number of women in the field can make forming community and finding mentorship difficult. The interpersonal gender dynamics in this male dominated field can cause women to alter their gender presentation - leaving “feminine traits” at the door – and reporting a diminished sense of belonging [22]. Women with more conventionally feminine appearances are perceived as less likely to be competent or suited for STEM careers due to the male gendering of STEM [23]. This, in some respects, imposes a perception of gender non-conformity for many women who otherwise would not identify as gender non-conforming within engineering. In the face of these gender dynamics there are professional organizations, student clubs, summer camps, and women-specific spaces which are avenues for forming support structures and mentorship for women in engineering. As mentioned prior, this has been critiqued as further entrenching the notion that we live within a binary gender system in which women have an inherent ‘lack’ which needs to be assisted [6]. The experiences and statistics of women in engineering and broader STEM fields lead me to wonder about those who may be further on the gender margins in terms of visibility and representation.

Nonbinary, gender nonconforming, and transgender students face elevated levels of harassment, discrimination, and violence on college and university campuses compared to their cisgender peers [24]. This targeting is often labeled transphobia or gender bashing. Transphobia can be described as “emotional disgust toward individuals who do not conform to society’s gender expectations” with similar terms being “binary genderism” and “gender bashing” [7], [25]. These forms of targeted discrimination and violence are not only aimed at nonbinary students but

also men and women who are gender nonconforming or transgender. Lack of access to gender affirming spaces (such as gender-neutral housing or gender affirming bathrooms) has a significant relationship to increased suicidality for nonbinary, transgender, and gender nonconforming college students. The binary sex segregation of spaces creates a physical built environment which reinforces compliance to a binary gender system to the detriment of those outside the system or whose relation to the system is complicated [26], [27]. Other areas on campuses which are sources of discrimination or structural gender binary enforcement include health care, class programming, student support, administrative systems, and records departments [28].

A landmark study with over 22,000 participants sought to capture the societal landscape for transgender individuals in the United States. The results of the study identified that 31% of the transgender population identifies as nonbinary or otherwise gender nonconforming [5]. Some of the findings include that 59% have avoided a bathroom within the past year, 46% report verbal harassment, a suicide rate ten times the national average, three times the unemployment rate, and 16% have left a college or vocational program due to harassment. Other studies have found that 39% of TGNC students, faculty, staff, and administrators have faced harassment on college campuses. It is worth discussing whether our culture, which can sometimes be described as hostile or chilly towards women, provides a safe and supportive environment. My own personal hypothesis due to the lack of literature is that we will find dynamics for TGNC students that are equally, if not more, hostile and chilly. It has been found that LGBTQ+ individuals in STEM have a rate of closeting (hiding their LGBTQ+ status from peers) which is nearly double the national average. Engineering students in particular report higher levels of discrimination, exclusion, and negative experiences than when they are elsewhere on campus [30], [31].

I would like to reiterate and explicitly state the importance not to conceptualize or categorize transgender and gender nonconforming engineers outside the demographics of men and women. “Women” includes cisgender and transgender women, “men” includes cisgender and transgender men. Men and women all have various degrees of gender conformity and nonconformity. As defined before, cisgender is a descriptor for a person whose gender aligns with the gender assigned at birth. Transgender is a descriptor which describes a person whose gender differs than the gender assigned at birth. Transgender and gender nonconforming are adjectives, not nouns. This is important as it complicates what we are talking about when we mention “men” and “women” in engineering. Men and women’s experiences, sense of belonging, and social acceptance may vary within each category due to degree of gender nonconformity or transgender status. Most TGNC people are solidly within the gender binary but face marginalization due to others’ perception of their body. The basis of gender bashing is not so much about identity as it is about bodies. It is the bodies of men and women and the categorization and perception of these bodies which become the targets of gender bashing. Together, this unsettles the notion that gender identity is a discrete and unitary dichotomous variable. Can studies accurately use a binary gender variable to produce valid research findings, or do the nuances of gender complicate its ability to be used this way? Intersectional feminist theorists assert that many categories such as race and sexuality complicate this notion of a singular gender experience as well. Audre Lorde asserts that straight white women and lesbian black women exist within the intersections of power dynamics of sexism, racism, and homophobia in society. Sexism is racialized, homophobia is racialized, homophobia stems from gender conformity, all of these

concepts are woven together [32]. Gender is not as simple as an M and F variable and our research should move away from this precarious over simplification.

Provoking Discussion

As stated prior, finding safe bathrooms without fear of judgement, harassment, or violence for nonbinary people is a source of immense stress for nonbinary students. Governments such as the cities of Portland and Austin have addressed this by mandating most single stall restrooms be designated as gender neutral. Our university also has a goal of transitioning all single stall restrooms to be gender neutral, as well as placing gender neutral and accessible bathrooms in all new buildings. Many men and women who are gender conforming with health concerns, private needs, or disabilities benefit from gender neutral accessible bathrooms as well. The addition of the gender designation X alongside M and F on Oregon and California driver's licenses and birth certificates indicates rapidly advancing policy and legal recognition. While these represent real and measured strides towards nonbinary gender inclusion in society, structural changes are just one part of the picture. A cultural paradigm shift in gender relations will need to occur. I believe many parts of the engineering discipline need to be proactive and not reactive to these changes.

How do we expand gender inclusion for all students? What interventions and changes can we begin to make to move them from liminal spaces and towards centrality? What would an engineering work force look like without two discrete unitary sets of professional dress standards? Legal recognition is expanding and this is one of the most rapidly progressing structural change taking place regarding gender in society. However, legal definitions alone should not be the basis for our inclusion and validation of others' gender presentations and identities. I believe we must channel our human compassion and empathy towards others as the first and foremost reason. Myself, as a woman, do not find the gender theory and schema present in this paper to invalidate my existence. It instead expands my worldview towards accepting every human's unique relation to their gender. The cultural lens through which I see gender strives to be broad and inclusive – reducing and eliminating stereotypes and rigid boxes others must fit within. It is my hope that this wonderful experience can be shared by other engineers.

I would like to add some additional context on the social positioning where I am writing from. I consider myself a gender nonconforming woman. My social and professional sphere includes many nonbinary, transgender, and gender nonconforming individuals. Gender nonconformity through the years has shown up through my style of dress, lack of adherence to socially expected patterns and behaviors, my queer expression of sexuality (which situates myself outside of normative heterosexual gender interactions), and a rejection of the gender binary. My own experience is that this nonconformity has led to a diminished sense of belonging in engineering workplaces and classrooms. I have often believed that if I behaved, dressed, or spoke differently in engineering contexts that I would have a higher sense of belonging and engineering identity. I surround myself with those who make me feel good about myself, who validate our collective existence – I have struggled to find this within engineering. This paper is informed both from years of close kinship with other TGNC individuals and my research into gender theory and TGNC experiences.

The following are two areas in engineering – classroom interactions and professional standards – which I situate suggestions for further gender inclusivity / gender expansion. They are presented as sources of discussion, investigation, and experimentation of integration.

Classroom Interactions

There is a growing body of literature for instructors to utilize when creating inclusive classrooms for diverse student populations. Vanderbilt University student Brienne Harbin created a summary of best practices and pedagogical approaches for gender diverse classrooms, which may be useful to engineering instructors [18]. One best practice is awareness – being well versed in understanding the nuances of gender and the issues gender nonconforming individuals face in society. When in the classroom, some other practices include sharing name-in-use and pronouns for all those in the classroom at the start of a year, explicitly detailing a policy of respect, politely correcting misgendering which occurs in the class by yourself or others, and avoiding inquisitive questions of students perceived as gender nonconforming.

Most of the time discussions around inclusion of LGBTQ+ students focus on sexual minority students as opposed to gender minority students. Case, Stewart, and Tittsworth developed curriculum suggestions for use in STEM fields to increase inclusivity for TGNC students [33]. They include faculty becoming well educated in gender - removing the assumption that outwardly visible characteristics are the basis of students' gender, avoiding binary gender bias, and offering reading materials which are contextualized within gender-expansive medical, psychological, sociological, and feminist settings. The usage of gender neutral pronouns in the classroom when discussing engineers allows men, women, and nonbinary students to all see themselves as that engineer.

The following website contains further resources, education, and legal & policy implications for schools and teachers: <https://www.genderspectrum.org/resources/education-2/>

Professional Standards & Organizations

Navigating professional standards can be a source of stress for women in engineering, and I believe it is also stressful for nonbinary and gender nonconforming students. Several sources of gender constriction in engineering practice include administrative computer systems which track gender in a binary, professional standards, and engineering organizations.

Administrative systems are gendered and tied to the legal foundations of a gender binary [34]. These administrative systems socially and structurally enforce a binary and limit the spaces where nonbinary and gender nonconforming individuals can exist or be recognized. Administrative systems include college enrollment records, social security records, driver's licenses, and birth certificates. Expanding the gender options in administrative systems offers the ability to assess needs and acknowledging existence. Collecting organizational demographics may use data collection strategies presented prior from the HRC, or simply present nonbinary as a third option. Collecting broader gender demographics of a workplace may allow for assessment of diversity trainings or specific human resource concerns. In addition, the creation of administrative processes to change the name-in-use on email systems instead of using a

nonbinary person's legal name would assist in individual's true expression of their gendered lives which often can include self-asserted names which may differ from legal name of record.

Professional honorifics can be gender expansive which would include Mx. alongside Mr., Ms., and Mrs. Further acknowledgement of TGNC professionals around professional dress would need to occur culturally. Genderqueer activist and professional Jacob Tobia has written about their experience in professional settings and expressing their gender, which is distressing for them on many angles [35]:

“...for transgender and gender non-conforming people like myself, the question of what to wear to work becomes an exhausting question of identity and of survival. For us, the question changes from “*how* do I present my best self at work?” to “*can* I present my best self at work?”

... professionalism has been my enemy, because it requires that my gender identity is constantly and unrepentantly erased. In the workplace, the gender binary can be absolute, unfaltering and infallible. If you dare to step out of line, you risk being mistreated by coworkers, losing promotions or even losing your job... Would I still have the respect of my boss if I showed up in heels? Would I be treated as a professional if I wore earrings? Would I be taken seriously wearing lipstick? Would my colleagues respect me for who I am?”

What support structures across disciplines and workplaces have been created for nonbinary individuals? Organizations such as Society of Women Engineers (SWE) represent women, but not other gender minorities such as nonbinary or genderfluid individuals. I myself am a member of SWE and desire a more expansive approach towards gender diversity. What if SWE's mission statement framed their efforts towards women, nonbinary, and other gender marginalized engineers? What if we had an organization which not only represented the 14% of working professionals that are women, but the uncounted (perhaps 1%) of engineers who wish to utilize a third option? Women's organizations can expand past representing assumed cisgender women and towards advancing masculine gender non-conforming women, transgender women, and nonbinary individuals who also share liminal spaces in engineering both in terms of demographics and likely in experience. This would alter approaches towards professional dress to liberate all bodies from restrictive norms. This would represent gender solidarity and ally-ship with all non-dominant genders in a predominantly male-identified field. As mentioned before, the entrenchment of women-only-groups, lounges, and camps in our gender diversity efforts may be solidifying binary gender views for both men and women that gender exists on a binary further excluding nonbinary and gender nonconforming professionals.

A common misconception is that nonbinary, gender nonconforming, and transgender identities in society are rooted in sexuality instead of gender. Sexuality is not gender and vice versa – being a woman is a gender identity shared across various sexualities. It is often assumed that a woman's sexuality is straight (compulsory heterosexuality) which is one of many assumptions that go into the women's gender stereotypes. There is documented tension between the gay and lesbian community and the transgender community in both literature and my own experiences due to this sticky relationship between gender and sexuality. Members across these communities do not

always share the same experiences with gender leading some cisgender lesbian, gay, and bisexual individuals to exclude nonbinary, gender nonconforming, and transgender people from their social circles. This tension exists in parallel to each community's shared goals of dismantling heterosexism and heteronormativity [36]. OSTEM is a community with many resources, many of which do work towards LGBTQ+ inclusion, but internal dynamics – and the nature of need to understand gender as a different identity than sexuality – may limit their efficacy at expanding cultural acceptance in engineering. In addition to the sometimes-conflicting relationship between gender and sexuality are demographics. Nonbinary individuals comprise roughly 31% of the US transgender community, which itself is just 8.5% of the broader LGBTQ+ community, which demonstrates the liminal space nonbinary people may occupy in LGBTQ+ organizations [5], [37]. Programs such as ASEE Safe Zone Workshops also are a fantastic resource for LGBTQ+ inclusivity. The need for gender-expansive education for gender nonconforming men, women, and nonbinary engineers is distinctly different than sexuality-based education. Lesbian, gay, and bisexual inclusion typically revolves around someone's dating life outside of work. In regards to gender it is about how they dress, talk, behave, and identify at work and the degree of binary gender conformity.

I believe that trainings and workshops specifically regarding gender inclusivity and gender expansive understanding (not to be connected or conflated with sexuality) may be integral in shifting engineering culture.

Summary

On September 16th 2017, Georgia Tech fourth-year computer engineering student Scout Schultz was fatally shot by campus police in an incident which many close to Scout frame as a “suicide by cop.” Friends and family report 21-year old Scout navigated depression and social stress throughout their college years. Scout identified as “nonbinary, intersex, and bisexual” [38]. Each of these identities are impacted by marginalization and exist in the liminal spaces presented in this paper. This tragedy should prompt our necessary discussion around nonbinary inclusion – are our environments sources of affirmation, support, distress, or invalidation? Are we expanding gendered norms and presentations for all people in our quest for gender equity, or are we further entrenching often restrictive gender conforming binary standards? Reflecting on the ideas and literature highlighted in this paper offers several points of entry for engineers at all levels to reflect, discuss, research, and collaborate to make engineering a great place to be – for all genders.

Acknowledgements

This paper is dedicated in memory and solidarity with Scout Shultz, their family, and the Georgia Tech LGBTQ+ community. Not cited are friends and chosen family whose thoughts, input, and insight informed this paper.

We are grateful to funding from the National Science Foundation under grant EEC 1764103. D. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

References

- [1] G. Robinson, J. McIlwee, Men, Women, and the Culture of Engineering, *Sociological Quarterly*, vol. 32, no. 3, pp. 403-421, 1991.
- [2] D. Hatmaker, Engineering Identity: Gender and Professional Identity Negotiation among Women Engineers, *Gender, Work, and Organization*, vol. 20, no. 4, pp. 382-396, 2013.
- [3] D. Chachra, D. Kilgore, H. Loshbaugh, J. McCain, H. Chen, Being and Becoming: Gender and Identity Formation of Engineering Students, *American Society for Engineering Education*, AC 2008-960, 2008.
- [4] B. Yoder, *Engineering by the Numbers*, American Society for Engineering Education, 2015. Retrieved from <https://www.asee.org/papers-and-publications/publications/college-profiles/15EngineeringbytheNumbersPart1.pdf>
- [5] S. E. James, J. L. Herman, S. Rankin, M. Keisling, L. Mottet, M. Anafi, "The Report of the 2015 U.S. Transgender Survey," Washington, DC: National Center for Transgender Equality, 2016.
- [6] A. Phipps, Re-inscribing gender binaries: Deconstructing the dominant discourse around women's equality in science, engineering, and technology, *The Sociological Review*, vol. 55, no. 4, pp. 768-787, 2007.
- [7] Z. Nicolazzo, *Trans* in College: Transgender Students' Strategies for Navigating Campus Life and the Institutional Politics of Inclusion*. Sterling, VA: Stylus Publishing, 2017.
- [8] J. Barbour, J. Lammers, Measuring professional identity: a review of the literature and a multilevel confirmatory factor analysis of professional identity constructs, *Journal of Professions and Organization*, vol. 2, no. 1, pp. 1-23, 2015.
- [9] C. Eidson, R. Cole, J. Coley, "Not so Fast: Reassessing Gender Essentialism in Young Adults," *Journal of Cognition & Development*, vol. 15, no. 2, pp. 382-392, 2014.
- [10] J. McGuire, K. Kuvalanka, J. Catapa, R. Toomey, "Transfamily Theory: How the Presence of Trans* Family Members Informs Gender Development in Families" *Journal of Family Theory & Review*, vol. 8, no. 1, 60-73, 2016.
- [11] J. Garbacik, *Gender and Sexuality*. Danbury, CT: For Beginners Press, 2013.
- [12] Devor, A. "Witnessing and Mirroring: A Fourteen Stage Model of Transsexual Identity Formation," *Journal of Gay & Lesbian Psychology*, vol. 8, no. ½, pp. 41-67, 2004.

- [13] D. Joel, R. Tarrasch, Z. Berman, M. Mukamel, Ziv. M, "Queering Gender: studying gender on gender-normative individuals," *Psychology & Sexuality*, vol. 5, no. 4, pp. 291-321, 2014.
- [14] J. Butler, *Gender Trouble: Feminism and the Subversion of Identity*. Abingdon, UK: Routledge, 1990.
- [15] D. Poulin-Dubois, L. Serbin, J. Eichstedt, M. Sen, and C. Beissel, "Men Don't Put on Makeup: Toddlers' Knowledge of the Gender Stereotyping of Household Activities," *Social Development*, vol. 11, no. 2, pp. 166-181, 2002.
- [16] S. Ahmed. *Living a Feminist Life*. Durham, NC: Duke UP, 2017.
- [17] J. Butler, *Undoing Gender*. New York, NY: Routledge, 2004.
- [18] B. Harbin, "Teaching Beyond the Gender Binary in the University Classroom," *Vanderbilt University*, 2016. [Online]. Available: <https://cft.vanderbilt.edu/teaching-beyond-the-gender-binary-in-the-university-classroom/> [Accessed February 3, 2018].
- [19] Bureau of Labor Statistics. (2016). "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, Washington, D.C., 2016.
- [20] B. Yoder, "Engineering by the Numbers," American Society of Engineering Education., Report, 2015.
- [21] G. Robinson, J. McIlwee, "Men, Women, and the Culture of Engineering," *Sociological Quarterly*, vol. 32, no. 3, pp. 403-421, 1991.
- [22] D. Hatmaker, "Engineering Identity: Gender and Professional Identity Negotiation among Women Engineers," *Gender, Work, and Organization*, vol. 20, no. 4, 2013.
- [23] S. Banchevsky, J. Westfall, B. Park, and C. Judd, "But You Don't Look Like A Scientist!: Women Scientists with Feminine Appearance are Deemed Less Likely to be Scientists," *Sex Roles*, vol. 75, no. 3-4, pp. 95-109, 2016.
- [24] S. Rankin, G. Weber, W. Blumenfeld, and S. Frazer, "2010 State of Higher Education for Lesbian, Gay, Bisexual, & Transgender People," Report. Charlotte, NC: Campus Pride.
- [25] D. Hill, "Genderism, transphobia, and gender bashing: A framework for interpreting anti-transgender violence," in *Understanding and dealing with violence: A multicultural approach*, B. Wallace and R. Carter, Eds. Thousand Oaks, CA: Sage, 2002, pp. 113-136.
- [26] K. Seelman, "Transgender Adults' Access to College Bathrooms and Housing and the Relationship to Suicidality," *Journal of Homosexuality*, vol. 63, no. 10, 2016.
- [28] K. Bender-Baird, "Peeing under surveillance: bathrooms, gender policing, and hate violence," *Gender, Place & Culture*, vol. 23, no. 7, 2016.

- [29] B. Beemyn, "Making Campuses More Inclusive of Transgender Students," *Journal of Gay & Lesbian Issues in Education*, vol. 3, no. 1, pp 77-87, 2005.
- [30] J. Yoder, A. Mattheis, "Queer in STEM: Workplace Experiences Reported in a National Survey of LGBTQA Individuals in Science, Technology, Engineering, and Mathematics Careers." *Journal of Homosexuality*, vol. 63, no. 1, 2016.
- [31] K. Trenshaw, A. Hetrick, R. Oswald, S. Vostral, M. Loui, *Lesbian, Gay Bisexual, and Transgender Students in Engineering: Climate and Perceptions: Proceedings – Frontiers in Education Conference*, October 2013.
- [32] A. Lorde, *I Am Your Sister: Collected and Unpublished Writings of Audre Lorde*. New York, NY: Oxford University Press, 2009.
- [33] K. Case, B. Stewart, J. Tittsworth, "Transgender Across the Curriculum: A Psychology for Inclusion," *Teaching of Psychology*, vol. 36, pp. 117-121, 2009.
- [34] D. Spade, *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of Law*. Durham, NC: Duke UP, 2015.
- [35] J. Tobia, "Why I'm Genderqueer, Professional and Unafraid." *Huffington Post*. June 10, 2014. [Online]. Available: https://www.huffingtonpost.com/jacob-tobia/genderqueer-professional-b_5476239.html [accessed February 3, 2018].
- [36] J. Weiss, "Reflective Paper: GL Verses BT: The Archaeology of Biphobia and Transphobia Within the U.S. Gay and Lesbian Community," *Journal of Bisexuality*, vol. 11, no. 4, pp. 498-502, 2011.
- [37] Gates, G. "How many people are lesbian, gay, bisexual, and transgender?" *The Williams Institute, UCLA School of Law*. Report. April 2011.
- [38] C, Boone, "Mom of Georgia Tech student shot by police speaks out," *Atlanta Journal Constitution*. September 17, 2017. [Online]. Available: <http://www.ajc.com/news/local/ajc-exclusive-mom-georgia-tech-student-shot-police-speaks-out/o2CRkPrqeUp0eV78knyI7M/> [accessed February 3, 2018].