# Work in Progress: An Autoethnographic Account of a Female Engineering Intern

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# WIP: An Autoethnographic Account of a Female Engineering Intern

**Abstract**

This paper is a work in progress (WIP) that explores the experiences of a female undergraduate engineer, Kayla[1], in both professional and academic settings. Studies have found that women who persist in engineering describe themselves as having an engineering identity [1]. According to Faulkner, however, the normative engineering culture tends to make working relationships easier for men than women, and women are "visible as women, yet invisible as engineers" [2, p. 169]. This study focuses on the non-normative setting and culture of Kayla's internship due to its online format and strong female presence.

The work presented in this paper primarily examined her internship experiences with a company that "took pride in hiring female engineering graduates" and was "very accepting of women in engineering." Two frameworks were used to explore Kayla's workplace experiences: Faulkner's concept of in/authenticity [2], [3] and Godwin and Lee's engineering identity framework [4]. To understand Kayla's workplace experiences, our methodology followed the autoethnographic steps outlined by Chang [5]. This work has demonstrated how having a strong female presence to guide an aspiring woman in engineering encouraged her to authentically continue on this path and recognize her engineering identity.

**Introduction and Literature Review**

> *Throughout my summer internship, I really valued my mentor's willingness to help. If I had trouble understanding an assignment or task, both of my mentors were readily available to me to offer me the support and assistance I needed. However, one instance that really stands out in my memory of my summer internship was Jane's willingness to help me, even after my internship ended.*
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> *I went to the office in-person for my exit interview. I was asked standard questions about my experience, what I felt they could improve on next year, etc. She concluded my interview by expressing how even if I decided I did not want to come back next year, she would still provide me with any professional guidance I may need. She offered to act as a reference on other job applications, made sure I had her contact information, and explicitly expressed her desire to be able to support young aspiring female engineers. For me, this was a really impactful event. It made me realize that I had someone I could go to if I needed help, and that I was not alone in navigating the intimidating world of engineering.*
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> *(Entry from Kayla's journal)*

Kayla is a third-year white female undergraduate Civil Engineering student at the University of Florida. Like many engineering students she sought out a summer internship to gain work experience. Unlike many women engineering students, however, she found a supportive

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[1] Kayla is a co-author of this paper, and as such her identity has not been blinded.

environment that helped to further her identity as an engineer. This paper describes her experiences, in her own words, and demonstrates how engineering workplaces can become more inclusive.

To many engineering students, getting real world work experience in the field through summer internships has become an essential part of their undergraduate experience. Current academic literature has established the importance of internships and role models for engineering students [6]–[10]. Gaining professional work experience as an undergraduate is increasingly important for many engineering students. These experiences can show students what an engineering career's day-to-day would actually look like as well as help students gain employment upon graduation [11]. Internships also provide technical skills, professional skills, and a better understanding of what working as a professional engineer entails [12], [13].

However, these benefits do not accrue to all students equally. Engineering workplaces have a dominant workplace culture defined by heterosexual white men [14], resulting in significant attrition of women due to poor climate [15]. Marginalized students interning at these companies are also affected by workplace cultures. Specifically, women are affected by discrimination and sexual harassment from hostile working environments of internships [16]. Other effects include implicit biases, a feeling of needing to "prove yourself" to male colleagues and outright sexual or verbal harassment [2], [16]. While there is nothing in the literature on non-binary or LGBTQ+ engineering students in internships, research on these students in their engineering programs has identified similar issues, including marginalization, devaluation, and anti-LGBTQ bias [17]. LGBTQ+ students have coped with the heteronormative environment of engineering by "covering" cultural characteristics and "passing" as heterosexual, although this was accompanied with feelings of isolation [18].

Literature has also found that traditional internships can impact the persistence of underrepresented groups, such as women and minorities [16], [19]. Negative experiences such as unwelcoming climates and sexual and verbal harassment have deterred women from pursuing engineering [16]. Positive internships, such as Kayla's, have improved motivation and persistence of underrepresented people [7], [20]–[22]. Examples of positive experiences within internships include inclusive environments, perceived contributions to the company, and engineering problem solving [7]. While research in all of these areas continue to grow, most studies have examined barriers faced by women and minorities. Fewer studies have looked at the various impacts of positive internship experiences on women. For women, these experiences may be even more important as they can help to emphasize the differences between the academic and professional worlds, allowing students to be more prepared for life after graduation [21].

One approach to combatting the negative impact of workplace culture is through mentorship. Professional engineer Kim Parker Brown has said that "One cannot overestimate the importance of having someone who believes in you and is willing to act as a mentor" [9, p. 49]. Mentors can help a mentee transition into the professional workforce by providing guidance and alleviating stress, especially in the beginnings of a career [10]. For women in STEM, having a mentor of the same gender has been found to be particularly effective [8]. Hernandez [8] concluded that having a mentor of the same gender makes it more likely that active and valuable mentoring will actually take place.

In this study, we outline the effects of positive mentoring and internship experiences on women in engineering, which is not adequately explored by existing literature. Active mentoring and good internship experiences are important for undergraduate engineers because of the impact they can have on a student's future career path [9], [10]. Thus, we expand on literature by showing how active, same gender mentors can provide women in engineering with a feeling of authenticity in the field that they may not have experienced before.

**Theoretical Frameworks**

In this paper, we explore a female engineering undergraduate's experience within an internship with strong female leaders. Two frameworks were used to explore Kayla's internship experiences within this work in progress: Faulkner's concept of in/authenticity [2], [3] and Godwin and Lee's engineering identity framework [4].

Studies have found that women who describe themselves as having engineering identity persist in engineering [1]. Engineering identity is also important for women in order to feel like an "insider" and gain a sense of belonging in their engineering workplaces [23]. Thus, identity development is fundamental to study in order to improve teaching and learning environments, find new ways of understanding learning processes, and to aid in equitable education [24]. A number of factors can influence identity development, such as intrinsic motivation, precollege experiences, a sense of community, workplace experiences and familial influences [24]. A factor that is important for this study is inter-personal interactions, because these interactions "influence and connect identity and culture. Identity emerges through an ongoing dynamic process of interaction and interpretation" [23, p. 384]. The autoethnographic account of Kayla's experiences provide insight into her engineering identity formation through the interactions she experienced in an environment that is defined by women in engineering. To our knowledge, this is the first study to explore a first-hand account of how gender plays a positive role in engineering identity development and interactions within engineering environments.

*In/Authenticity*

Wendy Faulkner developed her theory of in/authenticity through a study of gender roles within engineering workplaces [2], [3]. Faulkner [2], [3] first used the term "gender inauthenticity" to describe the engineering dualities. Her theory examined the division of engineering into "technical" and "social" realms, where the technical was seen as "real" engineering. Stereotypically men were expected to engage in the technical realm, while women were expected to engage more with the social realm. Faulkner continued this research and expanded on gender in/authenticity in later work [2], [3], [25], [26]. Within many engineering firms she discovered that certain engineering roles were stereotypically gendered (e.g. technical work for men; personal interactions for women). Thus, some engineers, men and women, felt as though they didn't belong or were "inauthentic" due to gendered expectations. A similar phenomenon was found for undergraduate women in engineering [27]. Cech, Rubineau, Silbey, and Seron [27] found that the women in their study had lower professional role confidence with regard to engineering careers than men. This resulted in lower persistence in engineering degrees, and lower intentions to pursue engineering careers.

*Engineering Identity*

Engineering identity is widely studied in academia. One's engineering identity develops through a sense of interest, recognition, and performance or competence in engineering [4], [28], [29]. Many studies have focused on engineering identity development and gender, specifically focusing on development for women [30]. Studies that focus on the experiences of women have looked at persistence and climates in relation to engineering identity [23], [25], [30]–[38]. Similar to inauthenticity, one study described how women blended into their workplaces, stating

> For many women in these professions, constructing their identity at work is a matter of becoming an insider and gaining a sense of belonging in their circle of colleagues. Acceptance into the majority group may depend on how well one's identity is perceived to comply with cultural norms. [23, p. 383]

**Methodology**

To understand Kayla's workplace experiences, our methodology followed the autoethnographic steps outlined by Chang [5]. Data were collected in a field journal using three primary methods: self-observation, chronicling the past, and external sources. The majority of the data for this paper was recorded as self-observation as opposed to interviews or memory. Self-observation data was recorded at the time of the experience following a specific outline; when Kayla had a relevant experience, she would record the date, entry title, entry theme, a narrative of the experience, and her analysis of it. Data from memory was either intertwined into self-observation data when relevant, or as a separate entry following the same outline as the self-observation data.

We are using a co-constructed approach between both authors, Kayla and Gretchen[2], to do this autoethnographic research, similar to Martin and Garza [39]. This approach allows us to center Kayla's experiences, and dismantle the "researcher-participant hierarchy" [37, p.1]. As Kayla journeyed through her undergraduate career, she journaled her experiences in a shared document. Gretchen went through the entries probing for deeper reflections, finding underlying themes, and raising new questions. Over the course of a year, Kayla and Gretchen met bi-weekly to go over Kayla's experiences and discuss things such as the impact of gender, impacts on her engineering experience, interactions with classmates, and interactions within work settings.

Specific to this paper, we focused on Kayla's experiences with her internship over the summer of 2020. Kayla journaled her experiences and it became evident that she felt encouraged, a sense of belonging, and supported. Stemming from this, Kayla and Gretchen had a collaborative conversation that was recorded over Zoom at the end of Kayla's internship in order to understand how her experiences were influenced by gender and how they impacted her engineering identity. The conversation also brought up memories as well as other journal entries. The frameworks of in/authenticity and engineering identity were chosen for this paper because of their relatedness to the research in the form of assets. When writing her narrative, we aimed to use it as a means of "gaining cultural understanding" [5, p. 125]. This helped to ensure that Kayla was not merely describing her life and experiences but using it to learn about broader patterns in society. After the narrative was written, Kayla checked it for accuracy.

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[2] Gretchen is a co-author of this paper, and as such her identity has not been blinded.

Quality was monitored through the $Q^3$ framework outlined by Walther et al. [40] and Walther, Sochacka, and Kellam [41]. Every other week, even if no additional data was collected, Kayla referred to the $Q^3$ framework to ensure that data captured was accurate, unbiased, and relevant. Each $Q^3$ quality check-in consisted of rereading the framework and then focusing on a specific aspect. For instance, one week the focus may have been on theoretical validation while another week it was procedural validation. During these check-ins she made notes about potential conflicts and how they could be avoided as well as noting what she was doing well already. References to the $Q^3$ framework helped ensure that the data collected was authentic and pertinent.

## Findings

Kayla is a cis-gender, white female currently in her third year of a Civil Engineering program at the University of Florida. She sought her summer internship based on her interest in water resources. Upon speaking with the company employees at a career fair she was highly interested in obtaining an internship within their company. The internship was a ten-week program, conducted remotely due to COVID-19, in stormwater design at a small engineering firm in the Southeast. Her personal goals for her summer internship experience were to help her decide if she wanted to remain in engineering and to gain professional working experience. Her experiences at the company helped her decide to remain in engineering and pursue more internships in the future. For anonymity, names used within Kayla's narrative were pseudonymized.

Kayla is a cis-gender, white woman in engineering; thus, she is a gender minority in the field. We also recognize that although she is a minority, she does not experience the depths of marginalization that comes with other intersectional identities, especially race, non-binary gender, and transgender identities. Kayla holds privileges through her race and gender identity; therefore, we are explicitly addressing these privileges to underscore that she experiences discrimination based on gender alone.

*Kayla's Narrative*

One of the reasons that I was drawn to the company was because the recruiters were explicit about how important it was to have women working in engineering firms. A lot of companies probably say that, but I really felt like they genuinely meant it because they did have a lot of female engineers working for them. My company took pride in hiring lots of female engineering staff. I had one supervisor, whose name is Amy and then her supervisor who I was also in contact with, Jane. They were the two primary people that I talked to.

I was working on one project, primarily, and I would just do kind of the odds and ends on other projects. I worked on things that were not busy work, but also did not need critical engineering skills, obviously, because I'm not like a full-fledged engineer or anything. I did collect some data and organize it for them. I also did a lot of plan production where the project was already designed but I would label it, set up the sheets, do the cross sections for the roads and other tasks similar to that. I could tell the work I was doing actually mattered, it was not just assigned to me to occupy my time. My internship definitely improved my performance in engineering abilities

just because it really kind of helped show me the level of work that engineering has to be at -like the level of detail and precision, how carefully everything gets done. I also learned a lot about engineering in general, the process of how a project develops and the quality of work that they take.

My internship opened my eyes to other options for my future. I was always pretty sure I wanted to work in academia, maybe be a professor. I realized that I did like working at the company and I would definitely be more open to working in the private sector or the public. Before, I hadn't really seen myself working for a company.

The people I worked with treated me like an engineer. They were really supportive. Jane was very supportive in promoting my professional development and actively involved in trying to make sure that I learned a lot and had a good experience despite COVID forcing me to work remotely. My supervisors were just super trusting. It was my first internship and so I kind of expected them to maybe coddle me a little more, I guess, but they just didn't do that. They were very sure that if they gave me something I would do it. I wasn't really expecting that because I feel like a lot of times in school, maybe I'm second guessing myself or feel like other people are second guessing me, but I didn't really feel that way with them. They showed confidence in me and gave me tasks that were challenging, which gave me confidence because I was like, 'oh, they think I can do this.'

Thinking about being visible as a woman, not an engineer, I felt more visible as an engineer. Because I was working with so many women, it felt much more normal than being a woman in engineering does at school. I didn't really feel like I was sticking out, you know, it was good for me in that they just saw me mostly as an engineer intern worker not really like a girl. I really respected the women I worked for. They were professional, organized, hardworking and intelligent.

One experience that stood out to me with this internship was when I did go to the office for four days and work with my coworkers in person. A lot of the articles talk about how women in engineering try to play down on their femininity in the workplace, or they try to mask it, or steer away from it completely. But I really think that Jane, my supervisor, didn't feel that way. She wore pink sweaters, skirts, and very feminine things. I kind of realized from what I was reading that that's probably not a typical thing, to be openly feminine and also the boss. When I was shopping for work clothes with my mom, she was trying to get me to buy more feminine things. I said things like, 'No, I don't really want to wear color. I think it's unprofessional.' But then when I got there, I kind of realized that even though it's not really my style and I still wouldn't wear stuff like that, the reasoning before was a little more toxic than me just not liking it. It was more me focused on wanting to distance myself from being feminine, whereas I feel like Jane was just very true to herself in the office. Now, I realize I don't need to stick myself inside a box of trying to be masculine, and that you can be feminine and a valid engineer.

Even though it was during COVID, I definitely think I still had a good experience and in general, I still feel like I learned a lot. I probably would have learned more had I been in the office. I would have liked to see my supervisors in person more to gain even more mentorship and make stronger connections with them. At my exit interview Jane mentioned how important it was to

her that she promotes women engineering. From the very first interview to my exit, I continuously felt supported as a female engineer.

## Discussion

Kayla's authenticity and engineering identity development were tightly woven together within her positive internship experience. Because she was authentic in the workplace and her supervisors were supportive, she was confident in herself and began to identify as an engineer. In her undergraduate experiences she had low confidence because the environment she was in wasn't supportive and she second guessed her work. Undergraduate men in engineering are described to get more respect, and consequently become more confident [32]. Kayla's internship opposed this because her workplace challenged her and had confidence in her to succeed. The belief that "they think I can do this" gave Kayla confidence to believe in herself.

Another notable intersection of in/authenticity and engineering identity was Kayla's recognition of what professionalism was perceived as within an engineering workplace. Kayla had perceptions of engineering that were based on gender stereotypes of engineering. Personally, Kayla felt that to be an engineer, professional standards suggest you tone down colorful clothes and dress more masculine- developing a culture of inauthenticity for those who aren't masculine. Du [33] also described that women took into special consideration their attire in order to be taken seriously by their male peers. Toning down feminine physical presentation was a means of invisibility of gender and visibility of women's professionalism [35], [42]–[44].

Kayla's perception speaks volumes on what engineering has stereotypically been defined as, and unfortunately shows the persistence of these stereotypes. Gender in/authenticity stems from "how *gender symbols* (in the social ether) *co-produce* (alongside professional drivers) *engineering identities*" [21, p. 345-346, italics in original]. Fortunately, Kayla's internship within a workplace with a heavy presence of women opposed this stereotype and created a personal shift in what Kayla saw as an authentic engineer. Within this workplace, she saw that you can be authentic and an engineer, without falling into stereotypes.

### In/authenticity

Kayla felt that the company was "genuine" about their pride in hiring women from the first time she spoke with them at her career fair. Her authenticity began to form within this first interaction. She was supervised by two white women who were role models. They were authentic in their fashion, professionalism, organization, hard work, and intelligence. Because of the precedence they set, Kayla felt "visible as an engineer" and grew in authenticity by recognizing she doesn't need to try "to be masculine" to be "a valid engineer." Kayla's experiences oppose typical findings for women in engineering spaces. Hatmaker studied gender identity in engineering workplaces and found that the women described "workplace interactions that conferred a status based on being a woman rather than an engineer" [23, p. 386].

The workplace also created authenticity for Kayla to feel "visible as an engineer" not just as a woman. This is a critical point in her narrative because she flips the majoritarian narrative. Unlike Faulkner's inauthenticity of women operating in a male dominant space [2], [3], Kayla

was authentic in a predominantly female workplace, therefore she could feel authentic as an engineer. She felt she was capable of doing her work and could be herself within the workplace because of the precedent set by her supervisors.

Kayla's authentic workplace experience contrasted with her school experiences because she has lower confidence with school and feels that others also have lower confidence in her. She mentioned that her classmates weren't as respectful as her supervisors and they didn't value her opinion. Based on this response, Kayla was describing inauthenticity due to a confident male culture of engineering within school which was similar to Chachra et al.'s [32] and Faulkner's [25] findings.

**Engineering Identity Development**

A critical piece of engineering identity development is recognition as an engineer. This includes identity recognition by self and others. Recognition by others has been found to connect students' identities and agency beliefs [34]. Kayla stated that the people she worked with treated her like an engineer. Her supervisors did this through the level of tasks they assigned, the support they gave, and the confidence they had in her to do the work they assigned. Kayla became more confident in herself because of the confidence her supervisors had in her. Confidence has been found to increase as a result of internship experience [7], thus Kayla's shift in confidence bolsters previous findings.

Self-recognition of engineering identity is also crucial to identity development. Throughout her narrative, Kayla developed her engineering identity with personal experiences related to recognition. A notable shift in her own personal engineering identity was that prior to the internship she always saw herself as a professor. After her internship, she shifted her career aspirations into becoming a practicing engineer. Interestingly, prior to her internship Kayla had other career paths in mind. She thought she "wanted to work in academia" but her internship sparked her interest within the industry route. Kayla enjoyed working in the company, which "steered [her] more into working as a regular engineer" than she had expected. Kayla was not working in an area that she was particularly interested in, nonetheless this did not deter her from engineering. Her personal identity as an engineer was solidified. This finding is consistent with other studies that have found that internships increase student motivation to continue their engineering study [7], [20], [22].

Kayla's internship improved her engineering skills and competence to complete engineering tasks. Kayla was given various projects that "were not busy work." She was given challenging responsibilities that "improved [her] performance in engineering abilities" because she was able to see what "level of detail and precision" things get done and the processes behind project development. Kayla described that her internship gave her an understanding of real-world engineering environments analogous to women in Samuelson and Litzer's study [7]. Kayla was able to become familiar with engineering programs such as geographic information systems and participate in production planning. Kayla's experience also aligned with other undergraduate students that had stronger engineering identities due to their positive professional practice of design and analysis [28]. Through her internship, Kayla experienced what engineering entailed therefore she gained confidence in herself, bolstering her engineering identity.

## Conclusion

Although Kayla's internship was conducted remotely due to COVID-19, she had a positive experience that bolstered her authenticity and engineering identity. This project has demonstrated how having a strong female presence to guide an aspiring woman in engineering encouraged her to continue on this path and recognize her engineering identity. Within her internship, gender was never explicitly pointed out, therefore Kayla did not feel as though she was a part of the minority gender in her field. This helped normalize her gender in the workplace and allowed her to strengthen her engineering identity. Our findings expand on current research by providing an autoethnographic account of how positive internship and mentoring experiences can contribute to a feeling of authenticity for women in engineering. Employers can benefit from this work because it highlights the impact that a positive engineering experience can have on women pursuing engineering degrees, and how supportive and active mentoring can encourage women to continue on this path. Additionally, this work can benefit students by displaying that positive experiences exist. This can encourage engineers to intern in companies that foster authenticity.

## Future Work

The autoethnographic account of Kayla's undergraduate experience will continue until her graduation in 2022. She will continue journaling her experiences, interviewing peers, and talking with mentors for data collection. With this work, we intend to use her autoethnographic narratives to raise awareness about gendered conditions of engineering settings in order to promote diversity and inclusion. We also intend to highlight the impacts of positive internship and mentorship experiences for women in engineering. We hope awareness creates support and action towards more diverse, supportive and inclusive engineering environments.

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