

## **Board 39B: Navigating Intersectional Identities in Civil Engineering Education and Practice**

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# Navigating Intersectional Identities in Civil Engineering Education and Practice

## 1 Introduction:

Underrepresentation is a well-known and researched topic in academia, specifically for engineering that remains a White, male-dominated field [1]. Underrepresentation is defined by “a population’s representation in education and employment that is smaller than their representation in the U.S population.” It is also defined by the uniformity of representation by field, for example, “Although women have reached parity with men among S&E bachelor’s degree recipients—half of S&E bachelor’s degrees were awarded to women in 2018—women’s representation varies greatly by field and women are still underrepresented in S&E occupations” [1]. While representation of some student populations has seen an increase in the past decades (e.g., Latinx/Hispanic students have seen an increase in share of Science and Engineering Bachelor’s degrees awarded from 8% in 2008 to 12% in 2018 [1]), others have been stagnating or declining (e.g., Black and African American students changing from 4.7% to 4.3% from 2008 to 2018 [1]).

Underrepresentation affects students’ ways of experiencing engineering education and practice and creates unique sets of challenges compared to their majority-representing peers. Experiences such as “cold” campus social climate, lack of cultural relatability from curriculum context, or difficulty finding belonging in professional settings are well-documented and often related to some specific parts of the engineer’s identity, including race, gender, and culture [2]–[5].

Since reported challenges for underrepresented engineers relate to their identity, gaining further understanding of how engineers navigate their identities in education and practice would prove to be a valuable insight. This knowledge could assist in developing learning and work settings that include and utilize a wider range of perspectives and expertise. Ultimately, understanding how the intersectionality of engineers’ identities manifest in education and workplace settings will help improve the engineering workforce’s ability to find creative solutions to important problems [6].

The aim of this study is to gain further understanding of how underrepresented engineering students and practitioners navigate their identities in school and in the workplace. We seek to answer the following questions: *What are the challenges associated with navigating one’s identity in Civil Engineering? How does navigating identities affect one’s experience in Civil Engineering?*

## 2 Literature Review:

### 2.1 Underrepresented Experiences in Engineering Education:

Increasing diversity in higher education has been established as an important concern in engineering education [6]. This focus on diversity must involve systemic changes that can only be implemented by understanding the factors influencing student success in engineering. The

barriers to engineering student success can occur in many aspects of engineering education such as curriculum design, campus environment, assessment and feedback, and self-perception [7].

For underrepresented students, these barriers to success are well-documented and often fall under the umbrella of sense of belonging or engineering identity. Sense of belonging is defined by Strayhorn as “students’ perceived social support on campus, a feeling or sensation of connectedness, and the experience of mattering or feeling cared about, accepted, respected, valued by, and important to the campus community or others on campus such as faculty, staff, and peers” [8]. For underrepresented engineers, factors like campus social climate [9], academic mentoring [9], [10], and racial microaggressions [11] can damage their sense of belonging and affect their future in engineering.

We base our definition of Engineering Identity on Hazari et al.’s [12] definition of physics identity as the interaction of Recognition, Performance, Interest and Competence in the field of Engineering. This concept was further investigated by Kendall et al. [13], who studied factors influencing engineering identity of Latinx students by including personal and social identities to better understand the development of Latinx students as engineers. An example of the impact of personal and social identities on engineering identity is the research conducted by Revelo about the development of engineering identity for members of the Society for Hispanic Professional Engineers (SHPE) that showed that a membership in an organization that matched a student’s social identity could be greatly beneficial to their professional identity [14], [15].

## ***2.2 Underrepresented Experiences in the Workplace:***

When joining the workforce, underrepresented engineers face new challenges that can be attributed to the change in environment from higher education to the workplace. The engineering workplace tends to be a White, male-dominated space [1] often populated with older engineers, adding age to the potential factors influencing underrepresented engineers’ experiences within this setting. This change in environment impacts which identity will set underrepresented engineers apart from their peers, with gender often posing a more significant challenge than race in a male-dominated network [16], [17]. The lack of racial diversity in those spaces also impacts underrepresented engineers’ experiences and contributes to a feeling of isolation at work [16].

## **3 Conceptual Framework:**

### ***3.1 Identity Theory in Engineering Education:***

In this study, we focus on the individual experiences and identities of our participants. In this context, one’s identity can be seen as constructed out of different components such as social, racial, ethnic, and gender identities. These various components of identity are not isolated from one another, and can even be experienced as contradictory or incompatible [18]. In engineering education research, the term “engineering identity” is often used to describe the degree to which students identify as engineers, focusing on the meaning students associate with being “a certain kind of person” [19]. This definition of engineering identity has evolved over time to consider other identities such as social, racial, ethnic, and gender identities interacting with performance, recognition, and competence associated with a specific field such as engineering [12], [20].

One's identity is also influenced by the environment within which one evolves. These contextual constraints, in addition to an individual's personal agency in constructing their identity, must be considered while studying identity development [21]. Individuals tend to develop multiple versions of themselves, highlighting different components of their identities depending on the social group they are interacting with and what motives influence this identity choice in that particular setting [21].

The consideration of these various and intersecting identities has been a tool of choice in STEM and engineering education research to better understand the experiences of underrepresented students [22], [23]. This more complex and accurate representation of identity in engineering is an important part of our conceptual framework.

### ***3.2 Intersectional Studies in STEM:***

Related to the notion of intersecting identities is intersectionality. Intersectionality was initially introduced by Crenshaw in her 1989 essay, "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics." Crenshaw's theory emerged from Critical Race Theory and Black feminism [24], [25] and later expanded to various disciplines to "draw attention to the potential distortions that non-intersectional methodologies engender and suggest ways to rethink conventional methods more broadly in order to address the biases embedded within standard research practices" [26]. Intersectionality is more than an analytical tool that observes the intersection of various identities, and should be associated with a broader understanding of the relationship between identity and broader systems of underrepresentation [27].

In our study, the concept of intersectionality relates to the specific sets of challenges experienced by participants when navigating the intersection of different components of their identity in engineering. While numerous studies utilize intersectionality as a framework to study the intersection of race and gender, recent STEM education research has introduced a wider set of identities and themes studied within the intersectionality framework, such as engineering identity [28], sense of belonging [2], [29], social interactions and stereotypes [4]. This research suggests that in-depth exploration of the experiences of multiple identities could aid in bridging the gap between research and practice in STEM education [30].

Our aim in this study is to utilize intersectionality as a framework to guide our analysis and help us identify the various ways in which our participants' identities interact and how these interactions affect their experiences as Civil Engineers.

## **4 Methods:**

Our study follows a thematic narrative analysis method as described by Kohler Riessman [31]. The goal of thematic narrative analysis is to focus on "what" is said, rather than "how," "to whom," or "for what purposes" [31]. Narratives of our participants' experiences were collected over the course of three interviews.

#### **4.1 Participants:**

Eligible participants were civil engineering students or recent graduate civil engineering professionals (graduated within the last 5 years) that identified as underrepresented/marginalized. Participants were also selected on their willingness to share their experiences in engineering, and to participate in three interviews lasting from 45 to 90 minutes each. Each participant received a compensation of \$40 for each completed interview. Participants' identities were replaced by pseudonyms of their choosing to maintain anonymity and allow for a more open sharing of their experiences.

**Table 1: Participant Characteristics**

<b>Pseudonym</b>	<b>Gender Identity</b>	<b>Ethnic/Racial Identity</b>	<b>Civil Engineering Status</b>
Santi	Man	Mexican American	Professional
Camille	Woman	Filipino American	Student

Table 1 provides the participants' characteristics. All identity traits associated with our participants were self-identified. Our Civil Engineering student participant, Camille (She/Her) identifies as Filipino-American. Our practicing Civil Engineer, Santi (He/Him) identifies as Mexican American.

Our study was designed to focus on the experiences of two participants, one civil engineering student and one civil engineering practitioner. Studying a small sample is common for narrative analysis methods, where the recommended unit of analysis for a narrative research study is "studying one or more individuals" [32, p. 104], and will allow us to collect in-depth accounts of how our participants navigate their identities in Civil Engineering. While a small sample size does not allow for statistically generalizable results, it is often preferred to focus on the participant's voice and share a more holistic story [3], [33], [34].

#### **4.2 Data Collection:**

All interviews were semi-structured with open-ended questions about the participant's identity, origins, and academic/professional paths. Building on identity literature within STEM education [12], [20], we used the first interview as a way to explore our participant's social, racial, ethnic and gender identity as well as their sense of identity as it relates to civil engineering. We employed questions such as, "What led you to where you are today?," "How do you experience being a Civil Engineer?," and "What aspects of your identity are important to you?." Follow-up probing questions were then asked for participants to create a more elaborate story, such as "You talked about ..., tell me more about that.", "You mentioned ... Why is this important to you?," or "How did this event affect you?."

Following this first interview, main themes were identified in each participant's stories and more specific questions were designed for the subsequent interviews to better understand how each theme influenced one another. Additionally, intersectionality was the focus of the next two interviews, specifically understanding how the participant navigated different identities within different settings. We used questions such as, "If you were to write a book about your identity,

what would be the chapters?”, “If these two identities are different chapters, how do they interact in your daily life?”, and “You talked about feeling ... in [specific setting], can you tell me more about that?”.

#### ***4.3 Data Analysis:***

First, we read each interview transcript multiple times to gain better understanding and familiarity with the participant’s experiences. We then analyzed and coded inductively each interview one at a time following a thematic analysis model [35]. This first round of coding was focused on identifying each participant’s identities, background, and specific experiences related to Civil Engineering. This process was important as it built the foundation for the next two rounds of interviews. Coding was then repeated for each subsequent interview, building on the codes previously established for each participant, and creating new codes if a new theme emerged from our interviews.

After the 3 interviews were coded in that manner, we performed a second round of analysis on each interview. Thematic narrative analysis methods were used to identify emerging themes and patterns in our participants’ stories, which allowed us to draw a clearer picture of the main identities and challenges our participants experienced. Specifically, the question asking participants to describe their identity as a book and list the chapters helped define which main themes should guide the analysis of their narratives. Utilizing Hazari and Carlone’s [12], [20] framework of engineering identity, we identified the various aspects of engineering identity that participants described in their narrative (i.e., Performance, Recognition, Competence).

Lastly, we performed a third round of analysis during which the interactions between various identities were analyzed using an intersectionality framework. This provided us with insights on the interactions between participants' identities and guided the construction of the thematic narrative presented as results.

#### ***4.4 Researcher positionality/ Research Trustworthiness:***

Utilizing Walther, Sochaka and Kellam’s [36] qualitative research quality framework, we documented quality consideration throughout the entire research process. While generating data, we ensured that an authentic dialogue was created with participants, focusing on their personal experiences. The content of each interview was subjected to review by the participants, providing them with an opportunity to correct or omit part of their narratives. During data analysis, the principal researcher added to their field notes and consulted previous field notes to identify potential misinterpretations or biases towards data. Member checking was employed between the principal researcher and the participants to ensure the accurate description of our participants’ experiences. Personal experiences, identity, and values create biases in every qualitative researcher that can further enable or limit their understanding and interpretation of the study. In the case of this study I, the principal researcher, am a White male and first-generation immigrant. My personal experiences with navigating different cultures and identities while becoming an engineer led me to be interested in this subject, and to understand the importance of this topic in engineering education.

It is important to question one's motives, biases and impact when conducting qualitative research ethically [37]. Positionality impacts multiple dimensions of one's research and must be explored to create more transparent research results [38]. This study aims to share the experience of our participants and bring public awareness to the complexity of navigating various identities in engineering.

## **5 Results:**

Our results showcase the narratives shared by our two participants. The narratives are organized by the three resulting themes which correspond to the main identities described during the interviews: Social Identities, Engineering Identity, and Navigating Intersectional Identities.

### ***5.1 Santi (Engineering Professional):***

#### ***5.1.1 Social Identities:***

Santi identifies as a Mexican American man who grew up in the U.S as a second-generation immigrant from Mexico. Santi describes his Mexican cultural heritage as very important to him, and as something impactful that gives him a different cultural viewpoint. However, throughout our conversations, it became clear that Santi described his American and Mexican identities as separate. He explains that his parents raised him from a Mexican cultural perspective, but that going to school also taught him American cultural norms. He mentioned on a couple of occasions the "cultural split" he felt growing up:

"Growing up it's like you split between two worlds really. It's difficult because a lot of times you almost feel like you don't fit into either group. Because in school you grow up as being a Mexican kid, but then, if I go back to Mexico, they'll want to call me American. It is just very interesting, being stuck in two worlds."

Santi also mentions the impact of social environment on his expression of cultural identity, and even how he thinks of his own identity within these two worlds:

"If I'm hanging out with my friends that are from international backgrounds, especially my Latinx friends, I definitely identify more with my Mexican heritage. But if I'm hanging out with White people or non-Latinx people, I may not necessarily think as much about my Mexican side, but I think it's just the nature of code switching. It depends on the people I'm talking to, but overall, I feel like it's always a blend of both. But in certain situations, one side will kind of come out more than the other."

After discussing more in-depth the feelings associated with this notion of being stuck between two worlds, Santi explained that while it was a challenge and often made him feel like he did not belong, he is feeling grateful to have this different perspective that could only be gained from a complex cultural background like his. This first part of Santi's narrative highlighted the complexity of navigating two cultural identities.

### 5.1.2 Engineering Identity:

Santi explains that his interest in Civil Engineering started when he was younger when he saw his dad work in the construction industry. He talks about “wanting to be like my dad” and “wanting to be a construction worker too.” As he grew up, he performed well in school, specifically in science, thus strengthening his scientific identity. He felt like college was the natural next step and enrolled in a civil engineering undergraduate program.

An interesting part of Santi’s engineering upbringing is the absence of pressure from his parents to pursue a college degree. He mentions that his dad went to college and that this made him think of college as a natural thing, but he also explains that interacted with cultural norms he experienced through various friends:

“It was nice to not have that pressure because I know I have a lot of friends who also come from immigrant families and for them it definitely was a pressure to go to college or become a doctor.”

The choice of pursuing civil engineering came from his father’s influence, but also from his personal interest in building construction and design, which led him to pursue a master’s degree in structural engineering. For Santi, an important aspect of structural engineering was having a positive impact on local communities:

“I think what would really interest me the most as a structural engineer would be to design buildings or structures that benefit more local communities. I think one day I would like to be able to design structures outside of the U.S, maybe go to Mexico where my dad is from. I think it'd be kind of cool to bring some of that knowledge over there and be able to design something that benefits the community.”

The quote above begins to demonstrate how Santi’s cultural identity intersected with his engineering identity, wanting to use his civil engineering knowledge gained in the U.S. to benefit the Mexican community—which is further discussed in the following section.

### 5.1.3 Navigating Intersectional Identities:

Santi’s experiences stem from the intersectionality of Santi’s engineering and cultural identities. As an engineering student, Santi mentions sometimes feeling culturally isolated as part of a small community of Latinx students at his university. He talks about feeling that he had no one to look up to in engineering and wishes that more Latinx engineers and students were present in his field. However, Santi had a sense of pride when interacting with other Latinx and Mexican American students on campus when he was a student:

“I really enjoyed seeing other Latinx students on campus. It was a nice feeling knowing that their family’s hard work had paid off. It made me feel pretty proud.”

The intersectionality of Santi’s cultural and engineering identities proved to be more complex as a practicing engineer. He mentioned not seeing many Latinx, specifically Mexican, engineers in his field and talks about the fact that he “almost forgets being Mexican” while at work.

“Reminders” of his cultural identity happened in two different settings, which created complex sets of emotions for Santi. The first setting was when he interacted with other Latinx/Mexican engineers in the workplace. These interactions tended to give Santi a sense of pride similar to his interactions with Latinx/Mexican students while in college. This pride continued when Santi was invited to speak to Latinx engineering students from a nearby university, connecting it to his current identity in the workplace:

“Speaking to them was a turning point for me as a Latinx engineer. I felt very proud of these kids, and it made me realize that I was in a similar situation years ago. I felt very empowered by it. And I think after that I started to really be proud of my Mexican identity in the workplace and not shy away from it or try to blend in. Because I feel like we need more representation and the only way we're going to do that is by being more vocal about our identity.”

Conversely, in another setting when Santi interacted with Latinx/Mexican construction workers on the jobsite, Santi struggled with his identity:

“One thing I did struggle with was, being in engineering, you visit construction sites often and most workers there are Hispanic or Latinx. What I struggled with was going there with my White coworkers. It feels weird being dressed up in “business clothes” just walking through the site and seeing a lot of these workers on the field are doing hard labor. When I see that I think of my dad, and I get reminded about how he is putting in that hard work for me and my brother to succeed in life. I feel torn about being in this different position than these field workers are, I almost feel bad that I was given this opportunity that they didn't necessarily get to have. I respect their hard work and I feel a type of way that these guys are out there having to work really hard all day long and have to work extra hours to support their families.

I have spoken to Hispanic people I've met on site about that and when they see someone like me, a younger Hispanic guy, they see it with a sense of pride. One of them said that it was nice to see that one of us is making it. That made me feel better about it, but I'm still feeling torn with the whole identity thing. I think that's mainly when it becomes a factor for me at work.”

Santi's description of these experiences highlighted the complexity of navigating cultural and engineering identities simultaneously. Ultimately, Santi decided to embrace his intersectional identity:

“I've spent most of my life feeling isolated. And I'm at a point now where I just feel like ‘why should I shy away from who I am?’”

## ***5.2 Camille (Engineering Student):***

### ***5.2.1 Social Identities:***

Camille describes herself as a Filipino-American biracial, bisexual woman, and grew up in the U.S as a second-generation immigrant from a Filipino dad. Camille explains that growing up in a

Western U.S state, she considered herself as White, but felt that her peers interacted with her and perceived her differently than they did other children.

“Being mixed, you don't really feel like you belong. As they say, ‘you're too Asian for the White kids and too White for the Asian kids.’. You don't think you belong anywhere.”

As she started college, her perception of herself changed and she became more comfortable talking about her Filipino identity, which made her feel like she could put this identity forward.

“I think talking to people helped me realize that I am allowed to be Filipino even though I'm only half. I think that's why it became more important to me in school.”

Another important aspect of Camille's narrative is how she described some of her identities as “hidden” and some “apparent for all to see.” While her ethnicity and gender were outwardly identifiable to all, her bisexuality was something that she described as more private. She talks about her bisexuality as both very important part of her and an identity that she can keep hidden from others if she does not feel comfortable talking about it. This choice whether to share her bisexuality is related to her upbringing and past experiences.

### 5.2.2 Engineering Identity:

From a young age, Camille's father, himself a mechanical engineer, would take her to engineering-related events, such as ASHRAE (The American Society of Heating, Refrigerating and Air-Conditioning Engineers) or Women in STEM, where she met many engineering professionals. This introduction to the engineering world and Camille's strong performances in science and advanced math formed the base of her engineering identity.

When deciding what her undergraduate major would be, Camille explains that of all the fields she considered, Civil Engineering seemed to have the most opportunities for public service work and impacting local communities, which persuaded her decision.

“I was looking at engineering already, just because I liked math and also public service work. So, I thought that engineering was cool, I feel like there's more public service work in civil engineering than other engineering fields.”

### 5.2.3 Navigating Intersectional Identities:

A recurring narrative across Camille's interviews was her search for community and belonging, and how she navigated that search while her sense of identity evolved over time. At first, Camille found it difficult to find a community that incorporated all the same identities as hers:

“I think it's hard as a person of color, specifically in civil engineering where there's not a lot of people of color. So, I found myself more leaning towards people who represented the other parts of me to build community. A lot of my friends were women or a lot of them were gay. I think maybe the combination of all my identities is kind of a lot, and I couldn't find all my identities in one person or one group of people. That was hard. It felt isolating.”

This search for a community representing certain parts of her was complex for Camille, as sharing part of one's identity is not enough to feel belonging to that community. A flagrant example of that is Camille's experience with other women civil engineers and SWE (Society of Women Engineers) members. Camille explains that she did not enjoy being a part of SWE because she felt too different from the other women she interacted with, a feeling also occurring with most women in her program. This feeling of difference was illustrated by Camille when describing herself as someone that enjoys "dressing nice, wearing makeup and fake eyelashes," which most women around her did not focus on. This difference impacted Camille's interaction with her classmates and even her perceived credibility as an engineer:

"It made me feel weird. A lot of girls have things to say about you wearing lashes or makeup, some of the girls in engineering don't really like that. I felt different from them and could not really relate to them even as an engineer. There were some girls that would not interact with me or wouldn't listen to me in class. That was frustrating. I don't think what you wear or the amount of makeup you wear determines how much you know. I was just as passionate about engineering as they were, so it was frustrating. I think that's why I started surrounding myself with people that were more like me."

Not fitting into this community initiated a shift in identity within Camille. She explains that her sense of identity as a woman of color grew significantly during her undergraduate program as she witnessed the lack of representation of women of color in civil engineering.

"It was hard to relate to other women because being a woman of color is a lot different than being a White woman. I think it made me not want to be a part of their community. If I can only relate to them as a woman engineer, it is not enough. It doesn't make me feel connected to them."

Camille mentioned on multiple occasions how parts of her identities would "take over" while interacting with different peers, such that Camille separated her identities depending on which groups she was interacting with:

"When I'm around my friends that are gay and bi, we talk more about our sexuality. When I'm around women, we talk more about being a woman than I would with men. And my friends who are mixed and Asian, we talk a lot about being mixed, or we compare the ways our parents act. If I'm with a certain group, they probe those topics to come out more."

Regardless of how she felt about some parts of herself, some of Camille's identities were open for everyone to see, as she describes it, "you just are that person, you can't hide it." This could at times create a divide between Camille's internal sense of identity and people's external perception of her. For example, Camille's gender was apparent regardless of the importance it had to her, but her sense of engineering identity and passion for engineering was not. This perceived difference led to situations where peers would assume the latter based on stereotypical ideals about the former.

“I’ve had someone tell me one time something he learned in statics, and he said, ‘it’s super interesting but I don’t know if you like math and science.’ And I asked, ‘What makes you think that? Do you ask your male friends that?’ And he said ‘no.’ Another time, I was presenting with a group of guys to a capstone panel, and none of the male panel members asked me any questions. This also happened to most girls in my class. Even worse, I was picked to speak at [important college event] and a male classmate came up to me and said that I didn’t deserve it and that I was picked just because I was a woman.”

Camille also explains that she believed these negative experiences were related to her being a woman and not specifically her being mixed race because the same experiences happened to other women in her cohort, which were mostly White women. While she explains that these experiences did not affect her emotionally or have a negative impact on her development as an engineer because they were not occurring very often, she also mentions that the way she navigated campus changed because of such experiences. She would, for example, avoid certain areas of campus where she knew some of the individuals that she had these interactions with would be present.

The intersection of Camille’s identities within the context of engineering impacted the development of her engineering identity. When asked to picture an engineer and describe it, she responded with:

“When I think of engineers, I usually think of a White male coming from a wealthy background. They had access to higher education in their life and considered themselves to be engineers early on. And for a woman in engineering, I usually think of a White woman as well.”

This mental representation of what an engineer typically looks like, when added to Camille’s personal experience, led her to not identify strongly as an engineer. She even makes mention of having “imposter syndrome” during her undergraduate program and questioning if she should be an engineer, which seemed to be a common feeling within her social circle. Today, as a recent graduate, she explains that she sees engineering as a career and something that she is passionate about, but not as an integral part of her because this status could change over time.

Lastly, when reflecting on her identities within the context of civil engineering, Camille shares the following thoughts:

“I think about when I was a kid, and I didn’t see people who looked like me or who were like me. I wonder if I had met someone who was like me, would that have helped me? That makes me want to be that for someone else, I want to motivate people. You can’t change anything if you don’t start with yourself. I would want to get involved in Civil Engineering outreach programs in my community and go to schools to talk to students about being an engineer. Because I think there’s a lot of power in that.”

## **6 Discussion:**

This study of the narrative of 2 participants exhibiting and experiencing drastically different social identities showed intriguing similarities and allowed us to gain a better understanding of the similar ways they navigated their identities in civil engineering.

Firstly, the importance of one's environment on their identities and how this environment impacted their identity development [21] was an important aspect of both narratives. Both participants mentioned expressing or repressing various identities depending on their social environment. This behavior was accentuated in the context of engineering, where both participants felt that other engineers tended to relate their social identities to their competence as an engineer. Such interpretation from others, based on social norms and cultural stereotypes, impacted the participants' sense of engineering identity and could lead to further their sentiment of isolation [12], [20].

Secondly, the feeling of being "stuck between two worlds" occupied an important part of both narratives, suggesting that the intersection of multiple social identities would prevent Camille and Santi from fully experiencing belonging within one of these identities. This feeling was also heightened within the context of engineering. Santi's experience of navigating his Mexican and engineer identities in the workplace constitute a vivid example of the complexity of navigating intersectionality. Similarly, Camille struggled to relate to other women engineering students, while finding more of a connection with her Filipino identity.

Lastly, it is important to mention that our participants' narratives showed the impact of diverse representation in engineering. Indeed, whether considering Camille's interactions with diverse engineers as a young woman, or Santi's interactions with LatinX students as a professional, it is clear that such experiences assisted in reconciling their social and engineering identities. The desire for both Camille and Santi to engage in community outreach activities as engineers show their willingness to embody both their social and engineering identity in a public setting. Santi is motivated to give back to the community of his father, while Camille wants to change the landscape of what an engineer looks like by being a role model to future engineers. Ultimately, both Camille and Santi are learning to incorporate all aspects of their identity as they navigate the civil engineering field.

## **7 Conclusion and Future Work:**

Through this study, we gained a better understanding of the complexity associated with identity navigation in engineering, more specifically for underrepresented persons that experience various social identities. Navigating their social and engineering identities showed to be a challenge for our participants, both in the context of their personal and professional lives, where interactions with peers in an academic or workplace environment led to identity conflicts. Both Camille and Santi often felt stuck between the worlds of their multiple identities, not fully belonging in any, leading to feelings of isolation. Their multiple identities were also linked to how they perceived others and how others perceived them within their academic and workplace environments. However, they began to reconcile and appreciate their multiple identities as they

continue to navigate civil engineering, even being motivated by their intersectional social and engineering identities.

For engineering education research to broaden its impact to all students, it is important to consider intersectionality of identities (i.e., social and engineering identities) when studying student experiences. Such consideration could assist in improving the diversity and inclusion of historically marginalized populations in engineering. Future research on the topic of identity navigation for underrepresented students could include a wider array of participants and consider different engineering fields. Gaining a deeper understanding of challenges associated with specific aspects of one's identity could help improve students' experiences within the engineering field.

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