Illuminating the Pathways of Latine and Hispanic PhDs into Engineering Teaching-Focused Faculty Positions

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Abstract

Latine and Hispanic engineering students rarely see a faculty member whose background mirrors their own. The NSF AGEP (Alliances for Graduate Education and The Professoriate) Hiring Interventions for Representation and Equity (HIRE) project focuses on increasing Latine and Hispanic representation in the professoriate through interventions aimed at making the hiring process more equitable. As part of this larger project, our team is conducting research to understand and elucidate the experiences on the pathway to the professoriate of the currently underrepresented Latine/Hispanic population in STEM teaching-focused positions. To do this, we employ in-depth qualitative interviews of current teaching-focused faculty who have successfully navigated the pathway through PhD programs into the teaching professoriate. We use a subset of six interviews with Latine/Hispanic engineering teaching faculty (out of a more significant set of 20 interviews with the broader STEM teaching professoriate). We seek to understand and elucidate the unique pathways and challenges for this population in both their pathways to their positions as well as their experiences in their current faculty positions. To analyze the pathways to the professoriate, we employ a community cultural wealth framework (Yosso, 2014) that accounts for six forms of cultural capital that communities of color employ to navigate institutions that traditionally value only hegemonically valued forms of cultural capital. In tandem with community cultural wealth, we utilize transition theory to understand their experiences moving out of the graduate student role and into faculty positions. In particular, the transition into faculty positions has been studied for non-minoritized populations and into research-focused positions. We aim to add to the literature about Latine/Hispanic faculty pathways in teaching-focused positions. We present findings from a thematic analysis of our results on the role of intersectionality (across axes such as immigration status, language, country of origin, colorism, race, gender and class) and its impact on the path to the professoriate, the use of community cultural wealth to navigate multiple institutions of higher education, and the importance of culturally relevant mentorship both on the pathway to and in faculty positions.

Keywords: higher education, teaching professors, community cultural wealth, servingness, latine and hispanic faculty

Illuminating the Pathways of Latine and Hispanic PhDs into Engineering Teaching-Focused Faculty Positions

There is a shortage of Latine and Hispanic representation (as well as other minoritized populations) in the field of engineering, which cascades into an even more dire lack of representation in the engineering professoriate. NSF statistics on engineering undergraduate student populations indicate that U.S. higher education engineering undergraduates remain predominantly white and male, with women awarded only 22.2% of engineering bachelor's degrees in 2018, which is incidentally one of the highest gender-to-degree disparities in U.S. STEM education (NSF, 2021). The disparities also cut across race and ethnicity lines, with only around 16% of degrees awarded to Black and Latine students in 2018 (NSF, 2021). Compared to other STEM and non-STEM disciplines, these statistics highlight that engineering remains a discipline that requires specific attention to increasing diversity, equity, and inclusion.

To increase diversity, inclusion, and retention of underrepresented faculty in engineering, our research project looks to study those who have successfully navigated the pathway to the teaching profession. We focus specifically on professors in teaching roles (whether tenure-track or otherwise) as they often serve as the ‘face’ of the discipline by interfacing with the most students in the classroom and teaching the most introductory level courses. These teaching-focused faculty (TFF henceforth), while having different responsibilities across disciplines and institution types, are united by their devotion to teaching and serving. At Hispanic-Serving Institutions (HSI’s henceforth), institutions of higher education in which at least 25% of the enrolled students are Latine or Hispanic, the work of Latine and Hispanic TFF becomes an integral part of meeting the mission of serving these traditionally underrepresented students. Servingness (Garcia et al., 2019; Garcia, 2020)

According to data from ASEE (2018), Latine and Hispanic assistant engineering professors only accounted for 5.4% of all assistant engineering professors, which pales in comparison to even the tiny amount of Latine/Hispanic student representation in the field. There is a dire need to create parity in who is taught and who is teaching. Previous research (Bañuelos & Flores, 2020) supports the benefits of creating this parity and the current disparity's negative effects. While we are wary of relying on panethnic labels, as our population of TFF spans a range of identities, backgrounds, and immigration statuses, we do use the terms Latine and Hispanic (not interchangeably). However, we write, analyze, and theorize with the understanding that identities are not monolithic; rather, they are intersectional and complex. We create a dialog with our research participants around these topics and respect and use their preferred terminology when referring to individuals. Our argument focuses not on a homogeneity of experiences because of shared backgrounds but because of the structural forces imposed on this population by institutions.

This research project is part of a more considerable multi-campus research effort to increase equity in hiring Latine and Hispanic STEM teaching-focused professors (Funded by NSF Award #2113355). Our project looks to support the larger grant initiative by qualitatively studying the experiences of Latine and Hispanic teaching-focused professors both on the pathway to and in their current positions. While ‘teaching-focused faculty’ (which we will refer to as TFF in this article) have many names across institution types, such as lecturer, professor of teaching etcetera, the findings of this research project have the potential to better inform both University's support of and inclusion for Latine students on the pathway to the professoriate. By understanding how students experience the transition from the role of the graduate student into the role of a professor, we can offer Ph.D. granting institutions valuable information about how

to best support their minoritized students and their minoritized faculty. Additionally, to those either on or on the track to this pathway, this research offers a roadmap that can illuminate the often tremulous pathway to the professoriate. As HSIs (and the funding attributed to them) as well as Latine/Hispanic student populations (Mora, 2022; Santiago and Cuellarsola, 2024) are growing steadily in numbers across the country, understanding how to support and prepare Latine and Hispanic individuals for future teaching-focused faculty roles will be an essential contribution to the conversation of creating an inclusive higher education landscape.

This article presents preliminary data on six TFFs in engineering out of our larger sample of 20 STEM TFFs. We provide background on our theoretical frameworks of community cultural wealth (Yosso, 2005), which we use to study the educational experiences of TFF on the pathway to their positions, as well as transition theory (Meleis, 2010; Anderson et al., 2011; Schlossberg, 1981) which we rely on to analyze our research participants transition into the role of professor. We provide qualitative findings from our in-depth interviews that outline the experiences of Latine/Hispanic TFF both on the pathway to and in the role of professors. Finally, we provide a discussion focused on how Latine/Hispanic students are served and supported by our population of TFF, while often not being recognized by the institution. We conclude with recommendations for future scholars pursuing similar work.

Background

Existing Issues in Engineering Education

To diversify the professoriate, it is important to re-evaluate how minoritized individuals are prepared for academia and what skills they need to succeed in their job search, especially for teaching-focused positions. Common factors that contribute to the lack of diversity among

faculty populations include a focus on candidates who earned their degrees at elite universities (Clauset et al., 2015) and a heavy reliance on student evaluations in the context of demonstrating teaching excellence, which are known to be biased against women, minoritized faculty, and international instructors (Boring et al., 2016; Boring, 2017; Merritt, 2008; Radchenko, 2020). Many interested individuals may not even consider teaching-focused faculty positions, as graduate students and postdoctoral researchers face tremendous pressure to select research-focused careers (Tudor, 2018).

We need to learn more about the experiences of teaching-focused Latine and Hispanic faculty who have participated in the teaching-focused faculty job search process as it currently exists. Over the past 15 years, the number of Hispanic Serving Institutions (HSIs) in the U.S. has more than doubled from 245 in 2005 to 569 in 2020. While the designation of an HSI is based on undergraduate enrollment criteria, higher education institutions must provide adequate service to the students that they admit (Garcia, 2019). One way of providing service to the growing number of Latine and Hispanic students is to increase the parity of who is taught with who is teaching. The disparity is highlighted when looking at analyses of a subset of HSIs from 2009-2016, which calculate that the "average ratio of Latinx student-to-faculty ratio is 146:1, whereas the corollary white student-faculty ratio is 10:1" (Vargas et al., 2018; p. 39). This research project is an effort to assist our broader AGEP project in diversifying the teaching professoriate and provide necessary guidance for future Latine and Hispanic faculty in navigating their pathways to the professoriate.

It is necessary to understand the challenges historically marginalized students face in STEM education, with a particular emphasis on engineering. Individuals identifying as Latine represent 13.6% of those awarded an engineering bachelor's degree in 2021 (Shpe-LDC, 2023).

Latine students within Hispanic Serving Institutions (HSIs) leave STEM majors at significantly higher rates than non-URM (Underrepresented Minority) students (Toven-Lindsey et al., 2015). Additionally, they are graduating at lower rates in STEM majors at two and four-year institutions when compared to their peers pursuing the same field of study (Contreras & Contreras, 2015).

Issues such as belonging in STEM and socioeconomic status remain pivotal. Latine students face unique challenges navigating the STEM pathway (Rodriguez & Blaney, 2021). Factors such as limited access to advanced STEM courses during K-12 education, insufficient mentorship opportunities, and a lack of representation in STEM faculty and leadership roles can create barriers for these students are all barriers for these students (Dias, 2017).

In addition to the lack of diversity concerning race and ethnicity, engineering education has continued to conserve a gender gap. Although women are enrolling in college at higher rates than men, engineering education is still largely homogeneous and heavily dominated by men (Camacho & Lord, 2013). Expanding upon the pre-existing gender disparity, it is noteworthy to acknowledge that women encounter implicit bias within the engineering pathway and may also contend with stereotype threat, creating an environment that is perceived as "chilly" or unwelcoming for them. Growing research in engineering education has highlighted differences in women's educational experiences compared to men's. Women in engineering education have reported experiencing heightened levels of overwhelm due to the pace and workload of the engineering curriculum, reduced comfort in asking questions in class, lower confidence in their abilities, and a diminished sense of belonging (Metz et al., 1999). The lack of diversity concerning gender and race/ethnicity in engineering education influences the development of broader society. As such, we must make sense of the experiences of Latine engineering faculty who have persisted through the engineering pathway.

Theoretical Background & Research Questions

To provide more context to pathways into teaching-focused faculty positions in engineering, we examine the assets that Latine and Hispanic PhDs bring into the higher education space. It is essential to highlight Critical Race Theory, which aims to analyze how social identity and power intersect with race and racism to mold existing social structures (Solorzano & Bernal, 2001). Inspired by the research about CRT, Tara Yosso (2005) developed the Community Cultural Wealth (CCW) framework, which takes an asset-based approach to recognizing the cultural wealth that students from historically marginalized backgrounds (i.e., Communities of Color) contribute to society. CCW encompasses the following six forms of capital: (1) Aspirational, (2) Familial, (3) Linguistic, (4) Navigational, (5) Resistant, and (6) Social. We strive to use this same assets-based approach to our research, rather than focusing on deficits within students, as has often been the case in the long history of education research. Focusing on assets rather than deficits highlights the forms of capital students from nondominant communities bring to the classroom and work experiences (Denton et al., 2019).

Aspirational capital refers to the ability to persevere and maintain a sense of hope despite barriers in education. Familial and social capital build on ideas of family and personal networks of people and resources. Linguistic capital refers to skills obtained through experience in various ways of communicating through multiple languages. Navigational capital is the ability to maneuver through systems built to work against individuals from historically marginalized backgrounds. For example, a student who has knowledge of the critical date to drop a course without receiving a transcript notation of a “W” on their transcript has navigational capital. Resistant capital refers to knowledge that is acquired through taking an active role in challenging

the status quo. This challenging could come in the form of choosing the engineering pathway despite being advised to pursue a career in marketing.

In conjunction with the community cultural wealth framework, we utilize transition theory to understand the experiences of Latine and Hispanic as they shift from the graduate student role to faculty positions. This encompasses faculty members' experiences in their current positions, including any obstacles they encountered on their path to the role and the challenges they currently face as faculty. The transition into faculty positions and into research-focused positions has been studied for non-minoritized populations.

Our primary research questions are twofold and are exploratory. First, how have Latine and Hispanic STEM PhDs utilized aspects of community cultural wealth on their pathways to the teaching professoriate? Our question is specifically designed to unpack and understand the aspects of community cultural wealth that were useful along the pathway to the professoriate and the institutions of higher education valued or devalued certain forms of cultural capital. Our second research question asks how the work of STEM Latine/Hispanic TFF is contributing to servingness for students who share an identity with them. Servingness is a multidimensional conceptual framework developed by Gina Garcia (2019; 2020) designed to measure the effectiveness of institutions in serving Latine and Hispanic students on the metrics of academic outcomes, an organizational culture that enhances student experiences (frameworks that were not included in the original HSI mission which focused primarily on enrolling students). Essentially servingness is a metric of the efforts to support student inclusion and thriving, a metric in which the role and work of Latine and Hispanic TFF are integral. We derive this question and our projects broader motivation from Garcia (2019, p. 4) who argues that, “Moving from servigness as a theory to an actual practice requires learning with and from HSIs that are currently

implementing these practices.”. We see this work as looking to those who are contributing most to servingness within the classroom to explore how and how much they contribute to higher education institutions' servigness, as well as to how these institutions can best support them.

Method

In pursuit of our primary goal of elucidating and better understanding the educational journeys and experiences of Latine and Hispanic STEM TFF, we conducted in-depth interviews with 20 individuals who are currently teaching-focused faculty at varying higher education institutions. While our overarching goal is to study these pathways and experiences in all STEM fields (to understand experiences across disciplines better), the results of our analysis in this paper are focused on the subset of six interviews from our TFF who have Engineering Ph.D.. Our study was approved through our university's institutional review board. Research participants were interviewed for 1.5-2 hours using the video conferencing software Zoom. Author 1 conducted all interviews for the project.

Our interview protocol (presented in full in Appendix A) was developed through an interactive process and a small pilot study of six interviews with teaching-focused faculty, and graduate students, including a mix of our target demographic and those with other minoritizing identities. The protocol focuses on two primary aspects. First, we explore our research participants' educational experiences leading up to their first job decision. Specifically, we structure this section around tenets of community cultural wealth (Yosso, 2005); investigating concepts such as family educational background, social networks in higher education, experiences in navigating higher education institutions, discrimination, mentoring, and reasons for pursuing an academic career. As researchers, this section of the interview gives us a great

deal of analytical purchase in outlining the current issues for undergraduate/graduate education for engineers of minoritized backgrounds, as well as forms of support that were most useful for this population.

Our second half of the interview protocol is devoted to our respondents' experiences in their teaching-focused positions. Specifically, we interrogate ideas like whether respondents feel like they ‘fit’ into their departments, how they feel their college or university could best support them, their definitions of equity, experiences as mentors, and whether they feel that students seek them out based on shared identity characteristics (race, ethnicity, gender etc.). Participants

Regarding our recruitment criteria, we recruited individuals who self-identified as Latine or Hispanic (or biracial) and were in faculty positions with at least 50% of their time devoted to teaching or at least two courses taught per term. We recruited individuals from all higher education institution types, ranging from community colleges to R1-designated institutions within the United States. Table 1 (*below*) presents some descriptive statistics of our sample. TFF has many names across institutions, such as professor of teaching/practice, adjunct faculty with potential for future employment, or the traditional associate/assistant professor. Participants were recruited through solicitation at various STEM education conferences, our personal networks, and snowball sampling (Johnson, 2014). Participants were asked to complete an 11-question survey prior, which acted as both an eligibility check and a demographic data collection instrument.

All research participants have been given pseudonyms from colleges and universities across the United States. Another notable feature of our sample is that we have international and domestic students (i.e., those who came to the U.S. for their education from another country and those who were born in the U.S.). We analyze this aspect of identity further in our discussion

section. Notably, we also have a skew towards women in our sample of engineers, which is interesting considering the predominance of men in engineering faculty (Camacho & Lord, 2013). While we do not have data directly related to the national statistics on gender of TFF specifically, 2018 data from ASEE (2018) show that women only make up 17.5% of tenure track faculty in engineering, and Latina/Hispanic women make up only 0.7% of this already small number.

Descriptive Statistics of TFF in our sample	Freq.	Percent	Cum.
Gender			
Men	1	17	17
Women	5	83	100
Institution Type			
Community college	1	17	17
Baccalaurate/Masters	1	17	34
Research 1 University	4	66	100
Immigration PhD Status			
International Student	3	50	50
Domestic Student	3	50	100
			N=6

Figure 1: Descriptive Statistics of Our Sample of Teaching-Focused Faculty

Our study's sample size in terms of engineering TFF is relatively small in terms of a phenomenological approach, or an approach rooted in the study of the phenomenon itself. In answer to the limitations posed by a small sample size we take a phenomenographic approach (one rooted in the how our group of participants view and understand the phenomenon (Larsson and Holström, 2009). Essentially we are more intently focused on how our participants conceptualize the pathway and transitions along it, as opposed to being focused on the structure of the phenomenon itself. In addition we utilize narrative inquiry (Connelly and Clandinin, 1990) in our interviews, offering participants leeway to describe the uniquity of their experiences at length. We believe that our approach holds distinct value in providing tangible roadmaps for

future marginalized engineers looking to travel the same pathways, as well as to educational policy-makers a description of the most prevailing issues of marginalized TFF in engineering as well as potential remedies to those issues (in their own words).

Data Analysis

Our data analysis team consisted of author one and author 2, who qualitatively analyzed the interviews using the qualitative coding software Atlas. Ti. We created our codebook through theory-informed, protocol-informed, and grounded coding (Charmaz, 2006). We based our initial codebook on six pilot interviews and subsequently developed it throughout our interviews. Our theory-informed codes focused on concepts defined specifically from previous theories, such as the six tenets of community cultural wealth (Yosso, 2005) and disciplinary microaggressions (Diaz Eaton, 2023). Protocol codes were derived directly from our interview protocol, i.e., family experiences in education, how teaching is evaluated etc. Most of our codes came from grounded coding, letting theory derive from our empirical data. In terms of validation of our coding, both of the authors involved in coding conducted initial inter-coding reliability checks before the analysis of the data began in full.

In the following sections, we discuss the thematic analysis of our data, specifically focusing on three aspects:

1. Our research participants' use of community cultural wealth on their educational pathways.
2. The servingness (Garcia, 2019) that our TFF offers to their students.
3. Their experiences within their current positions surrounding unrecognized labor they do within their departments/universities.

We interrogate the often-nuanced ways in which community cultural wealth assists individuals in navigating academic landscapes, as well as help to enrich the experiences of their students once in their teaching-focused positions.

Results & Discussion

Scholarly treatments of the PhD process that use community cultural wealth frameworks are relatively rare. Outside of the work of Espino (2014), who studied the educational journeys of Mexican American PhDs across multiple disciplines (primarily outside of STEM), and Pumaccahua and Rogers (2022) who studied the experiences of Black and Latinx doctoral student experiences at predominantly white institutions (PWI's), the conversation around CCW at the graduate level is, while burgeoning, still developing. While this conversation is one with only a few voices, we intend to contribute by both updating previous studies and contributing new data explicitly focused on those PhDs who decided to remain within academia in teaching-focused roles. Notably, our sample includes primarily early career TFF, so our research can speak directly to the experiences of this population who went through the PhD process relatively recently. We recognize that universities have been grappling with the concept of supporting minoritized doctoral students, and our research can unpack how and to what extent these efforts are successful.

This paper speaks directly to our project's focus on pathways into and experiences in teaching-focused positions. While our six engineering research participants come from many walks of life, they are all in similar positions at higher education institutions, specifically those focused primarily on teaching. We also consider that these individuals went to graduate school in various institutions, ranging from those in areas with large Latine/Hispanic populations to those

where they were minoritized. This paper speaks directly to our project's focus on the pathways into and experiences in teaching-focused positions.

Community Cultural Wealth and the Pathway to the Professoriate

To answer our first central research question, how have Latine and Hispanic STEM PhDs utilized aspects of community cultural wealth on their pathways to the teaching professoriate, we present thematic analysis of our data. We focus on how participants navigated their educational journey, often starting with their early education and continuing through the PhD process. We highlight two primary aspects of community cultural wealth as they are reflected in our participant's stories: (1) the dynamic nature of cultural capital and graduate education, and (2) building community and networks. Each of these concepts is where participants have detailed how community cultural wealth and cultural capital have been influential in their pathways. We present the words from our research participants verbatim.

The Dynamic Nature of Community Cultural Wealth in Graduate Education

Our research participants often spoke of tenacity or stubbornness that helped them in their educational journeys, specifically in overcoming rough or seemingly insurmountable conditions.

> I learned the hard way that I was not taking care of myself. Yeah because all of undergrad and early grad school I was just so committed to not failing. Yeah, that I never know, I never took a step back to assess like, how am I doing, like physically and mentally and emotionally. And most of the time, it was not well, I'm pretty stubborn, like, I'm pretty confident, i'm a pretty stubborn person that can push through all that. And I think I was at

> a near breaking point… But fortunately, building a support network around with other students in it was like an informal, we just started just sort of, it organically happened. (Marcos, an Associate professor at a primarily baccalaureate university)

Aspirational, resistant, and social capital are seen to interplay here and highlight that community cultural wealth as a theoretical framework is not an individual form of capital but rather a confluence of knowledge and skills. Sablan and Tierney (2013) articulate this divide between traditional interpretations of cultural capital and community cultural wealth, arguing that while cultural capital treatments often conceptualize cultural capital in static ways, community cultural wealth is a framework that recognizes the dynamic nature of cultural capital. It is evident here that different aspects of community cultural wealth are more or less valuable in differing contexts and at different times in an individual's educational journey. For instance, what we might consider resistant capital in this self-described stubbornness was detrimental once entering graduate education but useful in getting there. I asked Marcos to consider where this sense of stubbornness and resistance came from, to which he answered:

> I think that it was from, not from my mom but from my dad, it's pressure to want to be the best you can do. You have to do it, on your own kind of deal. There's a lot of family history, like on my dad's side, you have to do it on your own… I grew up in this mindset that you have to learn to do it on your own because others won't always be there.

Graduate education is itself a dynamic experience, which requires collaboration, personal aspiration, and, especially for minoritized individuals, a sense of resistance to racist and discriminatory structures over years. Unsurprisingly, forms of capital often instrumental in persevering through education up to graduate school were less useful in the cultural context of

graduate education. We can also see in some of our research participants how the dynamic nature of graduate education required a recalibration of what forms of capital they relied on. Luz describes how this process played out in terms of her reasoning behind not utilizing formal networking during her undergrad:

> As an undergrad, there was a Society of Hispanic Professional Engineers (SHPE), they hosted dinners and whatnot, I have to say that again, I've always felt like that's like, I don't want to be seen as the weak link or that I need that sort of support. So I never really related there even with Society of Women Engineers and stuff as an undergrad, it was like, oh yeah, that's not for me. I just want to be a professional engineer. I don't want to necessarily do these things. And it wasn't until grad school that I saw the value of those things, In graduate school, yes, I mean we started finding our professional societies… in graduate school I got much more from the professional organizations for sure. And even much more so now. (Luz, Professor of Mechanical Engineering at an R1 university)

As an example of this variable efficacy of different forms of community cultural wealth, we can see in Jessica's outlining of her perseverance in getting into graduate school by resisting rejection:

> At first, they turned me down (PhD application), … told me there's no way we'll let you in with these grades. and I said, 'but you're crazy like I've got a master's degree. I have proven already that I can do this', and he just kept telling me, 'No, we can't overlook this undergraduate GPA and blah blah blah'. I was really upset about that, and I kept thinking about it, and I said, 'no, that's, that's crazy'. That's crazy that that's what's holding me up.

> After all that I have work experience. I've got a master's. So, I called back…" (Jessica, Instructional Associate Professor at an R1 university)

We see that in Jessica's case, her resistant capital was utilized at a different point in her educational journey as Luz and Marcos. Jessica had work experience as an engineer, in addition to having earned a master's degree, and she recognized that there was something going on with her rejection on which she needed to push back.

Community Cultural wealth and Networks in Graduate Education

In terms of answering how community cultural wealth was helpful along the pathway to the professoriate we can look to critical points on the pathway that was evident across our sample of interviewees. We interrogate both concepts of community building and mentorship. Regarding community building, specifically with coethnic peers or peers who shared similar identity characteristics (gender, first-generation student status), our research participants posited that these social networks were integral to their success.

With the significant disparities in engineering, especially related to women in engineering, our research participants detailed the importance of finding mentors and advisors with whom they shared an identity, even if they were not in the same discipline. Alejandra highlights this importance when talking about her experience in traveling to the U.S. for a PhD at a predominantly white institution in the middle of America:

> There was nobody who was Latinx in my whole entire program. But I did know about a professor who was in technology. And so I actively looked for her, and then I started to go to her research meetings. She, She actually became one of my closest mentors because

> we could just talk as we are without like, any judgmental things going on. I could use my spanglish freely, which was a big deal for me… so talking to her, and her just helping me understand that there was, there was a place for me. (Alejandra, Assistant Instructional Professor at an R1 University)

Social capital was a necessary part of many of our respondents' pathways, and they often used both formal (through campus or national organizations), and informal (through personal networking) means to activate this social capital and find emotional support which was integral to navigating institutions of higher education.

In terms of peer support, our participants also described how finding like-minded and often small groups of peers who they identified with was essential to their success. These relationships often helped, especially for international and first-generation graduate students, in dealing with department and graduate student body culture that was discriminatory or intolerant. In essence, their social capital with those who shared resistant capital allowed them to persevere by weathering campus and department climates that were hostile to them. Additionally, respondents highlighted the concept of familial support, in ways that were not related specifically to guiding them through education. As many of our respondents were either the first to go to graduate school, or first-generation students themselves, their parents were often not able to help them directly with navigating these institutions. All of our respondents, whether first-generation students or not, indicated that their parents were influential in motivating them to pursue higher education.

Servingness for Latine and Hispanic Students

In answering our second research question, which considers to what extent our participants contribute to the servingness of Hispanic and Latine students, our findings align with current literature on the topic. Specifically for first-generation Latinx college students, Latinx college students' pathways into graduate education (as well as general support in institutions of higher education) are often bolstered and facilitated by the instrumental support of Latinx co-ethnic professors' ability to serve their students of similar backgrounds (Bañuelos & Flores, 2020). Furthermore, we see that our women professors indicate that, in addition to students seeking them out based on their shared ethnic background, female students would also often seek them out on a more frequent basis because of shared understandings of being a woman in STEM:

> So, this particular student was struggling, and she came to talk to me because another former female student said, go talk to Professor Ana because she understands… so yeah, they said specifically go talk to her because she gets it or she understands… and I've noticed that female students, and even the male students, they come more often even for little things. (Ana, Assistant Professor of Practice in civil engineering at an R1 university).

Our female research participants also often highlighted the fact that, in comparison to their male colleagues, they had more students on average reaching out to them or coming to their office hours. This is a phenomena that we have witnessed across all STEM disciplines, and is something we hope to expand upon in our future research. In particular, we are interested to see if Latina TFF play a specific role in the servingness of Hispanic and Latinas in engineering, where Latina faculty are one of the most minoritized in the professoriate.

A majority of our sample of international TFF also indicated that there is intentionality in their decisions to mentor students who share identity characteristics with them, as they felt that those mentoring/advising relationships were influential for them. This reciprocity in the relationship as professors is both formal and informal. For example, multiple professors indicated that they informally provide students free materials (books, snacks, calculators, rulers, etc.) as they realized, based on their own experiences, that first-generation and low-income students often dealt with financial insecurity. Notably, they do so out of their finances. Another example of supporting students of similar backgrounds comes through language. While not all of the engineering TFF in the sample spoke Spanish, those who did often posited that the ability to connect with others by speaking Speaking was influential in their networking along their educational journey and is something they feel they can use to build rapport and support students in and outside of the classroom:

> And that's, that's been helpful (referring to communicating with students in Spanish). I think it makes me, I hope, it makes me a little less intimidating for those students that are not as comfortable with their English and that they can sometimes get stuck with a word… and also just that they know that culturally even if I'm not speaking Spanish, they kind of feel like maybe I get them a little more. (Thalia, Professor of Engineering at a Community College).

In more formal ways, three of our research participants indicated that they started support programs for underserved students (one for minoritized students, one for women in civil engineering, and one for mentoring minoritized students).

We also asked about in-classroom experiences of professors, specifically whether they shared their identity with their students, or craft inclusive spaces for their students. Outside of one research participant who highlighted that they wanted to share their background as a first-generation Latina in science and engineering but couldn't due to Florida's recent restrictions on what topics professors can discuss, all research participants indicated that this was something they did

Hidden Labor Associated with Minoritized Faculty

While our research participants often stated that they were happy to support students in ways that their colleagues could not, they highlighted the issue of this becoming a subset of labor that was not recognized or appreciated within their departments. Our analysis of servingness, and the emotional and academic guidance that our TFF offer to students is work that is undoubtedly integral to student success, and doesn't necessarily fit neatly into the traditional research/teaching/service breakdown of criteria for tenure and promotion. This concept is illustrated in the words of Marcos' who states:

> but that added an extra level of work because now I have to do teaching, research, but I also had students coming in, and I knew that turning them down, that could have a negative effect on them. And so I find myself doing a lot more work, and thats one of the hidden costs I find with academia, that is oftentimes not valued, It's like, if you're underrepresented, you do a lot of hidden labor that is not seen or recognized.

This concept of hidden labor is one that came up across our entire sample of STEM TFF. In engineering in particular, where our research participants were more often than not the only Latine or Hispanic person in their department, this concept of hidden labor was exacerbated as often they would be called on to participate in a multitude of programs or initiatives based on their identity. One research participant Marcos who works at a medium, primarily baccalaureate university, posits:

> I've always been that Hispanic dude in engineering that they need, every bit. I'm the first one they reach out to. I have a hard time saying no… When it come to engineering and computer science, it's just me. I remember one of the vice presidents from the university was like, 'this is like the fifth event I've seen you at". I was like, "because you need a Hispanic in engineering." Like make a connection dude, like (laughs) its not as if I don't want to be here, but it's, it is just taxing on time.

Marcos' highlights that being the only or first person in their department to have their ethnic or racial background, often has strings attached that are invisible to administration and their colleagues. The concept of cultural taxation, which is defined as the manner in which responsibilities are placed on racially minoritized individuals because of their minoritized status (Padilla, 1994; Cleveland et al., 2018), is inherent in this extra hidden labor that these individuals participate in. While they may be happy to do it, it certainly takes valuable time away from both teaching and research (which are often the major criteria for tenure and promotion).

Our research participants often talk about how this lack of recognition in tenure and promotion materials surrounding the hidden labor they participated in:

> But still, what I do is still an oddity, because i'm trying to kind of do it all. I'm trying to do teaching, service, run a program and submit research proposals. So there is no model for that… they're setting up new policies for evaluation. I never got (*sic*) to make a good score on those evaluations ever, and i've been complaining about this for years, because it's not catered for who I am and what I do, i'm never going to get credit for these programs, that doesn't (*sic*) show up anywhere on my evaluations… for promotion, I was advised to take all of my administrative work off of that, presumably because it didn't count for anything, like nobody cared, even though that was most of my job at the time, so there's really just the reluctancy to change the model or to make the model more flexible. (Jessica, Instructional Associate Professor at an R1 university)

Wijesingha and Ramos (2017) posit in their analysis of the differences in tenure and promotion for racialized and female faculty that, when even when controlling for cultural taxation and academic discipline, racialized faculty face higher rates of being denied tenure, indicating potential racial discrimination in the academic system. While this study was not specifically focused on TFF, we are of the opinion that it is a necessity to any university wanting to increase retention of their minoritized faculty to recognize the cultural taxation inherent in their positions, specifically in the considerations for tenure and promotion. Additionally, it can be assumed that teaching focused faculty, with their higher levels of teaching, face disproportionally more requests on their time in the form of cultural taxation, since they interface with more students than their non-teaching focused faculty counterparts.

Limitations and Next Steps

In terms of limitations of our project we see one as particularly important for researchers looking to do similar work. In studying the experiences of those who have successfully navigated the pathway to the teaching professoriate, we do not capture the experiences of those who did not complete the journey. While the number of Latine/Hispanic students that graduate with an advanced degree is trending upward, there remains significant attrition for this population. Literature on the topic points to the current numerical disparity in representation for Latine and Hispanic students is rooted in a history of systemic barriers to degree completion (McGee, 2020; Fleming et al., 2022). While our research participants can speak to challenges and roadblocks on the path to the professoriate, there is still the possibility that we are missing key aspects of the experience that are insurmountable barriers to degree completion for this population. There also exists a large group of STEM PhDs that do not pursue academia, specifically in engineering, where industry careers provides a more enticing financial package (especially to students who come from lower-income socioeconomic backgrounds, and those supporting their expanded families).

In terms of future steps, we intend to further develop the study by continuing recruitment and interviews. Specifically, we hope to interview more men as our current sample of TFF (even across our broader sample of STEM latine/hispanic TFF) is skewed towards women. While this does allow us to categorically study the experiences of women in STEM, as a comparative endeavor, we would like to have a sample that is closer to gender parity between men and women. Additionally, our sample includes other aspects of identity that are particularly salient in studying the pathway to the professoriate, namely first generation student status and 2nd generation academics (i.e., having a parent or guardian who is a professor). By unpacking these

additional aspects of identity, we hope to provide a better understanding for institutions of higher education as to how intersecting aspects of identity play compounding factors in influencing the pathway to the professoriate.

Our findings indicate that Latine/Hispanic TFF are essential and unique sources of support for Latine/Hispanic students both within and outside of HSIs. We find that, like others have previously (Flores, 2017; Vargas et al., 2020), this unique resource is often not being fostered or supported by institutions in meaningful ways. While supporting Latine students is undoubtedly an oft-stated goal of colleges and universities, to do it in meaningful and effective ways requires a concerted effort from both administrators and those in pioneering faculty roles who are developing and implementing these programs. It also certainly helps to have faculty in these pioneering roles who know what and where the pitfalls are for underrepresented students based on their own lived experiences in higher education. As previously stated, this research project is part of a larger initiative that looks to increase the equitability of hiring for Latine/Hispanic faculty within one of the largest university systems in the country. While this project works to understand the pathways to the professoriate for those who have previously navigated it, other aspects of our larger team include the creation of rubrics to be used in hiring searches specifically for Latine/Hispanic candidates, as well as working with institutional leadership to implement and effect change from the top down. As such, our future research endeavors will allow us to, through the use of institutional data from our university system, provide quantitative validation of our findings in relation to our projects research-informed interventions.

Conclusion

Our project highlights the issues facing minoritized individuals on the pathway to the teaching professoriate. As part of our larger goal of making the hiring process more equitable for Latine and Hispanic STEM higher education candidates, we delve into their experiences with systemic barriers that are often overlooked. In order to best support these individuals, as well as retain these individuals institutions of higher education can do more to either decrease the load of cultural taxation on these individuals by, for example, hiring in clusters (Sgoutas-Emch et al., 2016; Freeman, 2019). In terms of policy reccomendations we highly support the suggestions of our interviewees to include cultural taxation and extra labor related to culturally specific mentoring into discussions and criteria for tenure and promotion. Additionally, institutions can provide funds to facilitate growing a social support network for Latine and Hispanic faculty across disciplines, which would be particularly beneficial for those entering departments in which they are the only Latine or Hispanic faculty member. While we have seen that some institutions are becoming more aware of these contributions to student support and the importance of creating networks, the concept seems to have reached the discussion table yet has not been implemented or institutionalized on a broad scale.

Furthermore, we show that the work being done by these TFF, goes above and beyond the call of the US Department of Education's Hispanic-Serving Institutions Initiative to increase numerical diversity in higher education institutions, by actively providing multiple forms of support for underrepresented students. This support takes a multitude of forms, one of the most prominent being their capacity to serve as role models and mentors to students who share a similar identity. Our research participants vividly recount the importance of strong mentorship and role modeling in their own educational journeys, as well as their devotion to serving in

similar roles for current students (often without being recognized for this work.) Our argument lines up with other scholars in the field, citing that institutions looking to support “Latinx students’ in their pathways into doctoral programs should invest in hiring more Latinx professors who reflect the characteristics of this student population and institutionalize rewards for professors that serve as empowered agents” (Bañuelos and Flores, 2020).

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Appendix A: Interview Protocol

Part A (Pathways) *Grand Tour Question* We want to hear about your path to your current position. Tell me about the people, things, and organizations that were influential in your path, ending with your job decision.

1. (Social) Tell me about your peers in graduate school.
    a. Was your program competitive? If so, how did that affect you?
    b. Were there people that you relied on? Tell me about those people.
    c. Were there other Latine or Hispanic people in your program? Students/faculty?
    d. Did you find any support from campus/national organization?

2. (Social) Do you feel you exited your graduate program with a reliable social network of peers/mentors?

3. (aspirational) Talk to me about your parent's or guardians experiences with education
        i. Do you have any siblings? Did they go to college/university?

4. (familial) In what ways did you find familial support during your educational journey?

5. (aspirational) Tell me about the biggest challenges and barriers that you faced in your educational journey

6. (aspirational) why did you decide to pursue an academic career?

7. (navigational) Did you ever experience any difficulties navigating the more bureaucratic side of higher education? (e.g., application process, financial aid).
    a. what resources, if any, helped you navigate these processes.

8. (navigational) How comfortable did you feel working with faculty, staff and administrators?
    a. Has this changed over the span of your educational journey, into your career? Why do you think this has changed?

9. (linguistic) Do you speak multiple languages?
    a. Do you feel that speaking multiple languages has been useful outside the home for you? Specifically in academia? How?

10. (resistant) Were there instances of discrimination or tokenization, or microaggressions that you can recall during your graduate program and/or faculty position?
    a. How did you handle these experiences?
    b. Looking back, would you have handled it differently?

Part B: Experiences in Current Position and in the Transition Process

Grand Tour Question: Tell us your experiences in your current position?

11. How would you define Equity?
    a. Was there ever a time in your academic career when you thought about diversity or equity in a different way?
12. Tell me about your campus. Who are the students on your campus? How accessible is your office to your students?
    a. Do you think your university sufficiently serves its Latine and Hispanic students? If so, in what ways?
13. Do you discuss (in general) race and ethnicity in your classrooms or lectures?
    a. Do you discuss your own identity with your students? Why?
    b. If not, do you think that your students know that you identify as Latine or Hispanic?
    c. Do Latine students often approach you because you share a similar identity?
14. Tell me about your teaching philosophy.
    a. Do you feel equally valued as other members of your department?
    b. How is your teaching evaluated
15. Do you feel that you fit in with your department? In academia?
16. How do you feel the university could best support you?