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What does an Engineering Instructional Faculty do? Voices of Engineering Instructional Faculty at Hispanic-Serving Institutions

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Abstract

This paper shares results from an exploratory study of how engineering instructional faculty (EIFs) at Hispanic-Serving Institutions (HSIs) define their roles and responsibilities. HSIs are known are for providing a student-centered education, enrolling more than 60% of Hispanic students in higher education. EIF are full-time, professional-track faculty who are evaluated primarily on their teaching. EIF are often not on a tenure-track but may be on a promotion track, depending on their department and institution. The career trajectory toward EIF positions is varied, and those varied academic and career experiences of EIF can enrich students' classroom experiences. Over the last twenty years, there has been an increase in the number of professional-track faculty in higher education. This increase is attributed to the need for subject-matter specialists who can bring extensive content knowledge and, in some cases, industry experience to the classroom. With the rise in the number of faculty in these roles and the number of posted positions for instructional faculty in engineering, there is a need to better understand what it means to take on an EIF position and what differences may exist across departments and institutions. Further, our current description of the roles of EIF is insufficient to understand all of the assets they bring to the engineering education system. This study aims to amplify the work of EIF by addressing the following research question: How do EIF at HSIs describe their roles and responsibilities as instructional faculty? To answer this research question, seventeen participants were recruited from six HSIs across two regions of the United States for virtual semi-structured interviews. The interviews lasted around 45-60 minutes each and included questions about the participants' pathway to an EIF position, their engagement with students inside and outside the classroom, their general responsibilities, and their experience, if applicable, with promotion and re-contracting. The interviews were transcribed and coded using data analysis software (NVivo). Data were analyzed using a deductive data analysis approach. The final codebook was based on three thematic areas and multiple iterations of coding and engaging in critical reviews of the codes by peer debriefers. Leveraging the job crafting framework, findings show that EIF craft their roles either by altering the scope/process of their work due to passion and the desire to support their students, or by building helpful relationships to support their students or by seeing their duties from a new perspective and changing students' perception about engineering. The need to support student learning is a motivating factor for job crafting by EIF. Faculty and administrators in engineering education could leverage the findings from this paper in providing support for students in Hispanic serving institutions.

Keywords: *Engineering Instructional faculty, Hispanic-Serving Institutions, Professional-track Faculty, Job responsibilities, Case Study, Job crafting*

I. Introduction

This paper shares results from an exploratory study of how engineering instructional faculty (EIF) at Hispanic-serving institutions (HSIs) define their roles and responsibilities. Over the last two decades, there has been a rise in full-time, fixed-term faculty appointments where teaching is the primary responsibility at both four-year and two-year colleges [25], [30], [31]. Research finding reveals that about 34% of all faculty members at 4-year universities are full-time, professional-track faculty [26]. These *instructional faculty,* as we will refer to them, see themselves as professional educators who intentionally leverage internal faculty development opportunities and implement evidence-based practices to influence curriculum design to ensure the success of their students [18], [25], [32]. To that end, their work in the classroom and with students is critical, particularly in engineering, where EIF teach high course loads, impact large numbers of students and bring authentic connections to engineering industry, as many come to these roles after working in industry [26], [25].

In addition, EIF at HSIs play critical and multifaceted roles in supporting engineering students and implementing educational change. HSIs are defined as two- or four-year nonprofit institutions that enroll 25% or more full-time students who identify as having Latin American heritage or origins [27]. While few HSIs were specifically established to educate students with Latin American heritage or origins, HSIs are uniquely equipped to enrich the outcomes of systematically and historically marginalized students through recruitment and retention initiatives and students-centered pedagogy and programs [33], [28]. Faculty are at the center of these and similar initiatives, with many engaging in new educational innovation efforts. EIF at these institutions, in particular, teach high percentages of lower-level engineering courses, which are critical courses for supporting persistence within engineering [2], [4]. In addition, prior research has shown that EIF want to develop and implement learner-centered, culturally responsive instructional designs, but lack the support given to their tenure-line counterparts at four-year institutions [18].

Given the recent growth in these positions, researchers have called for universities to address departmental and university-wide culture and policies around hiring, developing, and promoting instructional faculty [34], [35], [36], [26]. We know that a very important factor EIF consider in choosing their current role is the need to balance work and other non-work-related roles to maintain their general well-being [2]. Yet, in many cases, instructional faculty in engineering have reported a lack of support, challenges of inclusion in departmental decision-making, and a lack of respect and recognition by their peers and upper administrators [26], [29], [38], [35], [37]. Therefore, when developing these policies, it is critical to understand the current roles these EIF play within their institutions and how they have crafted those roles to both support students and overcome existing cultural and structural challenges.

The current broad description of faculty roles in teaching, research, and service orientations [5], [7], [8], [9] is not enough to describe the richness of the diverse roles' faculty, especially instructional faculty, occupy within academia [7]. Hence, there is a need for a theoretical lens to explore faculty's nuanced roles. As such, this paper aims to explore the lived experiences of EIF at HSIs and to capture the diverse roles and responsibilities they have within the context of their positions as instructional faculty. Through analysis of semi-structured interviews of EIF at HSIs,

these findings describe how instructional faculty craft their roles to achieve their goals and, ultimately, better support their students.

II. Theoretical Framework

A job comprises the assigned tasks and the relationships employees develop with others within the organization to achieve organizational goals [12]. To explore how EIF described their roles and responsibilities, we leveraged the job crafting model conceptualized by Wrzesniewski and Dutton [10] within the field of organizational behavior. Job crafting involves employees redesigning their roles and intentionally building relationships with others to accommodate their motivations and ideologies to ensure their overall fulfillment on the job [10],[6]. The way employees craft their roles is contingent on their workplace setting and available institutional support [7]. They do this by altering the physical, relational, and cognitive boundaries of their tasks [10]. Job crafting can create positive outcomes for both the employee and organization [6].

Wrzesniewski and Dutton [10] highlighted the following practices employees use in job crafting, (1) changing task boundaries, (2) changing cognitive task boundaries, and (3) changing relational boundaries. Changing task boundaries is a job crafting technique where employees alter either the type of task or the number of tasks at work. Employees alter their perspectives, thoughts, or beliefs about their job when they change the cognitive task boundaries of their job. Further, employees change the relational boundaries of their jobs when they alter the nature of their relationships with others in a helpful way. The job crafting model has connections with job design, meaning of work and social identity theories [10]. Recently, [15] leveraged the job crafting model conceptualized by Wrzesniewski and Dutton [10] to develop a job crafting scale to assess the work design and work satisfaction of 118 employees in different industries, ranging across education, business, financial operations, and construction. Also, job crafting theory has been used to study the roles and responsibilities of early-career scholars in engineering education [7]. Studies within the field of organizational behavior have shown self-efficacy to be positively correlated with job crafting tendencies [13], [14].

III. Methodology

A. Research Project Overview

This work is part of a larger multiple case study [2], [4] exploring the experiences and amplifying the voices of EIF at HSIs. Each participant was treated as a case. The current study discussed in this paper sought to answer the following research question: *How do EIF at HSIs describe their roles and responsibilities as instructional faculty?*

B. Participants

EIF are full-time, professional-track faculty who are evaluated primarily on their teaching [2]. At four-year institutions, these individuals are typically in non-tenure-line roles, while at two-year colleges they may have tenure-line roles. A total of 17 participants were recruited from six HSIs: two 4-year public universities (n= 7), two 2-year public colleges (n=5), and two 4-year private universities (n=5) across the southeastern and southwestern regions of the United States.

Table I below summarizes the institutional type, race/ethnicity, and pronoun distribution of participants. Participants were allowed to select all the different race/ethnicities that applies to them.

Table I: Participant Demographics

Institutional Type		**2-year public colleges**	**4-year public colleges**	**4-year private colleges**
Race/Ethnicity	**Asian**	1	0	1
	Hispanic/Latinx/Chicano(a)	0	5	3
	White, non-Hispanic	3	5	2
	Prefer not to say	1	0	1
Pronouns	**She/Her/Hers**	3	4	2
	He/Him/His	0	3	2
	They/Them/Their	0	0	0
	Prefer not to say	2	0	1

C. Data Collection

Data collection was conducted via virtual semi-structured interviews. The interview sessions lasted around 45-60 minutes each and included questions about the participants' pathway to an EIF position, their engagement with students inside and outside the classroom, their general responsibilities, and their experience, if applicable, with promotion and re-contracting. The following are some of the specific questions in the interview protocol administered to the participants.

What are the responsibilities that you have in your current position?
Given the goals that you have had professionally, how well do you feel like your current position meets and aligns with your professional goals?
Can you describe how a typical day is like in any of the classes you are teaching?

The interviews were audio-recorded using a video-conferencing platform. The recordings were transcribed and de-identified for analysis. This study was approved by the Institutional Review Board at the authors' institutions. The seventeen participants each selected a pseudonym to be used in analysis and dissemination.

D. Data Analysis

The interviews were coded using data analysis software (NVivo). Data were analyzed using a deductive data analysis approach drawing from Wrzesniewski and Dutton's job crafting model as

the guiding theoretical framework [10]. The final codebook was based on three key thematic areas adapted from the theory's three job crafting practices. The first author completed multiple iterations of coding, engaging between iterations in critical reviews of the codes by peer debriefers on the larger research team [19].

E. Limitations

This study focused on how EIF described their roles and not on the formal institutional descriptions. A future study could explore the nuances in how EIF described their roles compared to how their various institutions described the roles. The findings from this study provide foundational insights into the roles and responsibilities of engineering instructional faculty at two- and four-year HSI settings. Given the situated nature of job crafting and the ways in which different contexts enable different forms of job crafting [10], additional research is needed to understand the roles and experiences of EIF in 2-year private colleges, their length of experience in academia and EIF in non-HSI settings.

IV. Results and Discussion

Drawing from Wrzesniewski and Dutton [10], we identified and adapted three thematic areas shown in Table II below. Further, our analysis revealed these thematic areas and their respective subthemes, provide an understanding of how EIF craft their jobs along the lines of the three dimensions offered by the theoretical framework. Table II gives a summary of each thematic area, its definition, and an exemplar quote. Our results show that EIF are motivated to craft their roles and responsibilities due to their passion for their job and their desire to support students.

Table II: The three thematic areas, definitions, and exemplar codes

Thematic Area	**Definition**	**Exemplar Code**
Altering the scope/process of work due to passion or the desire to support their students	EIF tend to alter the scope of their position by adding more tasks to their role or changing the way they perform tasks because of their passion or their desire to support their students.	"I really like doing research and being involved in research... Because I'm a teaching assistant professor, so I'm not supposed to... I don't have any research responsibility, but I love doing it."
Building helpful relationships to support their students	EIF intentionally builds meaningful relationships with peers or students to support their students. The relationships sometimes result in collaborative efforts between instructors.	"So that's the nice thing about I guess having that pre-relationship with the professors is that I can communicate with them, and they're very helpful if I need any advice on a course."

Seeing duty from a new perspective and changing student's perception of engineering	EIF change the way they see their duty and this thematic area also captures the techniques they employ to change their student's perception of engineering.	"In academia, I feel like some of the stuff had been fulfilled, but it also comes with the package. You cannot replace those, for example, on weekends, but at the same time, they're my students, they're like my kids. If someone sends an email at 4:30 on a Friday, I'm not going to say, 'Well, I already left. I will get back to you on Monday.' Since you have deadlines on Monday, I still check my emails regularly throughout the weekend. There's a little bit of that pressure, actually."

1. Altering the scope/process of work due to passion or the desire to support their students

In our previous work with the same population of EIF, one of the central motivators EIF reported for pursuing professional development is to better support their students [2]. In the current findings, the EIF's passion for their job and their desire to support their students were again central to their decision to add more to their roles and responsibilities. This model of job crafting manifested across five subthemes: taking on the role of a storyteller in class, mentoring students in design projects, engaging in research to support students, engaging in outreach, and serving in leadership roles within undergraduate programs.

a. Taking on the role of a storyteller in class

Bailey is a tenured faculty at a two-year college interested in teaching computing and engaging in curriculum design. Having worked with a colleague whom she described as incompetent while in industry, she emphasized to her students the importance of being competent upon graduation. In her words,

> *I also realized when I became a teacher, the importance of really preparing students. Graduating with a degree doesn't mean that you really know the material.*

As a result of her industry experience, Bailey included her former colleague's story in her class sessions to inspire students to focus on building their skills and knowledge prior to graduation.

> *I tell my students that story. I tell them that…It's not something you can fake. You really have to know how to do it.*

In the same vein, Poobah, an instructional faculty who enjoys teaching the lab component of his course at a four-year private institution, used storytelling of how engineering is practiced, thereby situating his teaching authentically. According to Poobah, a lot of his students are first-generation, as a result, they may not really know what engineering is, in contrast to how he grew up in a family of engineers. Hence his decision to tell stories of the lived engineering experiences of his family members. In his words,

> *I think it's an advantage to teach them the culture of what engineering is like that I have that other people don't. I have an advantage more than people who have been practicing engineers because I am from a multi-generation of engineering. And I think that's one of*

the things my students really like. I can tell stories about my dad working on Voyager, my mom working on the Apollo program, and me going crawling on the floor watching her wiring computers together.

Bailey and Poobah's approach to instructional delivery entails crafting their instructional roles and taking on the role of a "storyteller" to encourage learning excellence for their students. Bailey and Poobah's unique teaching approach is consistent with research findings that portray STEM as being "fundamentally about people" hence the importance of sharing the lived experiences of their former colleague and family members [17, p. 249]. Further, research findings reveal storytelling helps students understand complex STEM concepts, increases engagement, and improves retention in STEM fields [11], [16].

b. Mentorship of students in design projects

Owing to the interest Hawkins, an assistant teaching professor at a four-year private institution, has in his students' development, he goes above and beyond what his contract requires. As an example, Hawkins serves as a faculty mentor to two student organizations that unconventionally comprise non-engineering students in addition to engineering students. This mentoring often occurs during non-work hours.

Yes, I'm not the president, but like the faculty mentor for two student organizations...which is like a student organization not only for the college of engineering, for anyone, and I'll come here like 8:00 PM. I have two daughters, they're five and almost four. So, I have to put them to bed, and then I'll come here at 8:00 PM, and I teach like little seminars for makers. Like Arduinos, programming Arduinos, like the basic stuff. A lot of these students are not even engineering students. They'll be like business majors... kids that want to learn how to make something with their own hands, and I teach them like rocket prototypes.

As a different example, Peter, an assistant teaching professor at a four-year public institution, is his department's co-undergraduate program director. Peter's contract requires him to spend his time primarily on teaching. However, his love for mentoring drew him into his instructor's role in the senior design class, where he mentors many student teams each semester.

So, for mentoring students…through senior design, I mean, it is a class, but it's a lot of mentoring of students...If I find students that are interested in it, then we sort of work together, and I try to mentor them.

Likewise, Mary is an assistant teaching professor at a four-year public institution whose duties include developing online courses, helping with ABET accreditation, and serving on several committees. As part of Mary's service responsibilities, her contract requires that she mentors two student teams for the senior design course, but she decided to go beyond the call of duty by mentoring three teams.

I'm also active in senior design project mentoring and mentoring students for senior design...I have in average three teams per semester. I mean, the department really wants

you to have only two teams, but I go a little bit beyond the limits of the department, and I have three teams per semester that I mentor.

The different mentorship efforts enacted by Hawkins, Peter, and Mary highlight the way they support their students' development in and out of the classroom. Their efforts are particularly helpful and align with recommended practices for addressing the issues of student satisfaction and retention among Latinx students [18]. In addition, mentoring has an additional benefit of aiding the professional development of faculty [20], [21].

c. Engagement in research to support students

Lady is a senior lecturer at a four-year private institution who loves teaching and was confronted with the challenge of student attrition in a course she was not particularly passionate about teaching. Her desire to support her students' learning and her unsuccessful attempts to find existing resources or solutions motivated her to conduct research studies on reducing student attrition rates in the course. Eventually, she developed a research-based intervention for the course.

One of the first classes I was assigned to teach, and it's not my most passionate class to teach... which to a lot of students is seen as a threshold course to get into engineering. I hate that aspect of it. I don't mean for it to be a threshold course. When I looked further into ... I had high attrition rates. I was like, "I'm not doing this right because so many people are failing." Then I started to look into the research and nationwide this class has a very high attrition rate, and it actually generates very little research interest. I don't know why. I first started to try to develop interventions to try to help my students that were struggling. Through different services that they have at school and different programs, I realized that I needed research-based interventions and when I didn't find them then I needed to create some myself. All of my research really is what can we do in the classroom to reduce the attrition rate in this incredibly basic yet somehow barrier class for engineering?

Cane is an assistant teaching professor at a four-year private institution whose contract stipulates that he spends about 90 percent of his time on teaching and service duties. Despite the fact that Cane is only left with a small portion of his contracted time to do research, his desire to support student learning through research motivates his involvement in research.

When we teach a subject, you don't want to rely solely on textbooks and the thrill that you find in prints. Especially if you're teaching a graduate class, you really want to be on top of research in that area. It helps a lot if you're teaching a subject that you're actively doing research in.

As a result, Cane's motivation to do research makes him spend non-workdays on research-related work.

I would have to use my personal time. I would work weekends. Because to be honest, let's say, you have five hours a week to do research, that's not enough to do anything. Especially

since I don't have students, I did not have a startup package. Your tenure track positions really come with the support of Ph.D. students for two years. I didn't have that. I don't have a graduate student working with me. I do have to rely on myself to get the numbers, get the data, synthesize whatever I'm working on, do the analysis, do the right thing, everything. That was a very time-consuming process. It took a big chunk of my time, my personal time.

There has been a concern in higher education concerning the possible interference between teaching and research [21]. However, for Mary and Cane, integrating research and teaching is necessary and helps them to support students' learning. Their ability to integrate research and teaching may allay the concerns of policymakers and administrators regarding the interference of research and teaching. Integrating research and teaching helps faculty to manage the growing demands of their classroom and it also helps them in increasing their research outputs [21].

d. Engagement in outreach programs

Besides Lady's involvement in research to support her students' learning, she began engaging in a robotics outreach program and she realized it supports students' attraction to engineering.

I realized that robotics brings in a lot of different engineering fields and it's also something that even little kids ooh and aah at. It's a great way to encourage students to participate in different fields of engineering and also to become attracted to come into engineering. I have several responsibilities. One is to help develop a certificate program for robotics... Another one is to mentor our students.

Victor is a professor of practice at a 4-year public institution. He got involved in outreach programs not necessarily because it is part of the assigned duty but because his interests cut across student interaction and engaging in outreach programs.

In terms of … doing the outreach, that's really because I like it...What I discovered through the years, I enjoy, is interacting with students. Working with them, seeing that they get engaged and in particular, my outreach activities, being the host for the robot competitions at different levels, I have seen the impact.

Further, Victor explained how his persistence in outreach programs over the years was instrumental in attracting and retaining students in engineering.

And I've been doing this for ten years now, and those students that were in middle and elementary school, or even high school, some of them went already to my classes, and some of them already even graduated. And the reason that they switch and decided to study engineering was that they participated in those events.

The need to "nurture a 'pipeline' of motivated students prepared to undertake the rigors of undergraduate engineering education" has been described as a reason why faculty in engineering should get involved in outreach programs [23, p. 21]. Drawing from this, we suggest that Lady and Victor's involvement in outreach programs is an attempt at not just attracting students into

engineering but to ensure the success of the students in engineering and ultimately retain them within the engineering 'pipeline.'

e. Leadership in undergraduate programs

In a bid to improve graduation rates, Peter took on a leadership role in his department, in addition to teaching, by becoming the undergraduate program director.

> *Then after my first semester, also became a co-undergraduate program director to help out with, let's say the program as a whole, trying to get graduation rates up, basically organizing the department as a whole in terms of undergraduate studies and making sure every student graduate and the course curriculum and all that stuff.*

Drawing from our findings, EIF are not just restricted to their primary duty of teaching, they are also involved in multiple other roles across the leadership spectrum in engineering education. One of the EIF that typifies this is Victor. Victor is the associate department chair; as such, he enumerates the number of leadership roles he takes on in his department.

> *I'm the associate chair in the department, I am in charge of the undergraduate curriculum. I support several of the tasks such as scheduling, managing personnel, laboratories. Also, I am, in part of academics, I'm an ABET accredited program evaluator. So, during the last cycle, I actually was a consultant to the entire college for the accreditation cycle...And I usually do coordination on some of the academic processes through the department*.

While the different EIF we interviewed might have different leadership styles, research findings show that their individual leadership styles could be leveraged to foster innovative practices in their departments [24].

2. Building helpful relationships to accomplish tasks

Part of job crafting includes how individuals "form interactions and relationships that compose the social environment at work" [10, p. 180)]. In this thematic area, we observed two subthemes related to how EIF built meaningful relationships with peers and students to support their students. In academia, faculty build community by either collaborating with or learning from peers [18]. In addition, research has shown that developing a meaningful relationship between faculty and students is critical to achieving students' learning goals [1], [3].

a. Building meaningful relationships with peers

Eva is a professor of engineering at a four-year public college who was heavily trained as a researcher but developed an interest in teaching due to the teaching experiences she had while in graduate school. She developed meaningful relationships with her peers, and this helped her to do more with less.

> *We give each other teaching suggestions, things like that. We share materials, we share contents if needed. So that's fine. For example, this semester, I teach introduction to*

engineering after three years and first time online because of COVID. Other faculty members who have been teaching this online would share their materials with me. And there are other things that I have been building content for and then I will share those with them. This semester, especially, I know that you said that you're going to jump to that later, but this semester because of the whole converting courses online situation, it actually promoted our collaborations because it's just too much to do by yourself.

Jody, an assistant professor of instruction, at a four-year public institution shared how her major reason for joining academia was her desire to bridge the gap between what students are learning in school and what is required in the industry. Jody attempted to bridge that gap by drawing from her years of experience in the industry. As an alumna of the institution where she now works, she leveraged the relationships she developed with faculty as a student to build new and meaningful relationships with her now peers, which in turn provided a support system for her and for her goals.

So that's the nice thing about I guess having that pre-relationship with the professors is that I can communicate with them, and they're very helpful if I need any advice on a course. So, the previous instructors, I go to them and say, I'm teaching this course this semester, do you have any advice for me? Are there any areas that you feel students struggle that I need to focus on? And they're very nice about sharing that information and being willing to help. So, I do have that flexibility as far as we can discuss it, and I can talk with them about possible classes I'd be interested in. And then in the future, we can try to work out a schedule.

Samantha is a senior instructor at a four-year public institution. She needs to secure money for new equipment to support her students in their lab courses. While she did not have significant experience pursuing funds of this nature, she was able to get the support she needed through meaningful relationships she has with more senior faculty in her department.

I am very blessed to say that I sought the support of a senior faculty to at least have signatures in terms of support, but we did get our first grant of $135,000 to upgrade the lab. I plan on doing a little bit more of that, of bringing equipment, novel equipment.

Individuals sometimes create relationships with others, due to the need to "introduce meaning into their lives" [10, p.183]. Building on this thought, Eva, Jody, and Samantha "introduced meaning" to their roles through the helpful connections they established with their peers thereby helping them to find resources and support needed for their jobs. This job-crafting endeavor by these EIF could enhance their positive identity at work [10], an area for future study.

b. Building meaningful relationships with students

Jody's ability to build meaningful relationships is not just horizontally inclined, i.e., with her peers, she is equally involved in building vertical relationships with her students. As a result, she feels supported by her students in her work.

> *I even have support from the higher division students. Because I try to keep that relationship with them, I guess, because since I just barely defended in the summer, before then I was a TA, and before working this spring, I was a TA. So, I know a lot of them one-on-one. And so, I keep that relationship with the students because, they'll give me advice, they'll confide with me. Oh, the students cheat this way or that way. And so, I have that background knowledge of knowing what to prepare for. So, I even have support from the students themselves.*

Poobah is another EIF who highly values developing meaningful relationships with his students. During the first year of the COVID pandemic, he shared how challenging it was to build those relationships, given that he lost that valuable time before and after class to speak one-on-one with students. In the interview, he reflected on one memorable example from before COVID to describe why he appreciates building these relationships with his students and what he hoped a return to campus would bring for both him and his students.

> *So, I was sitting next to one of my students in my class and I looked at him, I said, "Well, you look a little sad today." And he looked at me and he said, "Yeah, I'm having a really bad day." And he'd broken up with his girlfriend that he dated since high school. And he said, he'd messed up with his family and he'd messed up all kinds of stuff. And we had a nice just heart to heart. And frankly, from my perspective, that's my best day ever to be honored to get to talk to students about life and to care about them. That's more important to me than getting a chance to ram more engineering down their throats. That's fun to see them get excited about learning engineering but getting to actually help them with life and problems. And we talked back and forth many more times during that semester as he went through it, he actually went through about a depression and it was a mess, but he's doing great.*

One key thing that stemmed from the meaningful relationship Jody developed with her students is the support she received from them. This aligns with findings that reveal when instructors show care to their students, it fosters trust, contributes to the instructor's professional growth, and helps student learning [39]. Also, the satisfaction expressed by Poobah after speaking with one of his students may be a result of his belief that caring for the welfare of his students was more important than, as he put it, "ramming more engineering down their throats."

3. Seeing duty from a new perspective and changing student's perception about engineering

The third component of the job crafting framework that was employed focuses on a cognitive change, whereas the previous ones focused on task and relational changes. This theme considers how EIF change their beliefs, perspectives, or the lens through which they look at their jobs. In our analysis, two subthemes emerged: seeing students from another perspective and creatively pursuing solutions for students in resource-constrained environments.

a. Seeing students from another perspective

Cane supervises senior design and also offers ABET services to his department. He left industry for academia due largely to his perspective that teaching is more impactful on lives than developing a product people pay for. Cane's philosophy affected the way he perceived his

students (i.e., as though they were his kids); this framing motivated him to go beyond the call of duty.

> *In academia, I feel like some of the stuff had been fulfilled, but it also comes with the package. You cannot replace those, for example, on weekends, but at the same time, they're my students, they're like my kids. If someone sends an email at 4:30 on a Friday, I'm not going to say, "Well, I already left. I will get back to you on Monday." Since you have deadlines on Monday, I still check my emails regularly throughout the weekend. There's a little bit of that pressure, actually.*

Further, the way Cane perceives his students enhanced the relationship he has with them and this in turn made him do more than was required to support students' projects.

> *I tell them, if they're interested in exploring more about the topic, we can collaborate on a project. If they want to explore some of the ideas for their senior design, we can draft a project plan together. I try to get them engaged outside of the classroom using the information that they've learned in my class. I once tried ... Actually, we had good students. Well, I had good students in my class that they did such a wonderful project. I got the college media involved and they were featured on the college's website. We went beyond with the class requirement were for the project, or we went beyond the project requirement. I was okay spending more time with them. I was happy, actually, to spend more time with them because I really like they were into it, and they were really excited. I try to ask students if they want to be, let's say, tutors for the subject next semester*.

It is noteworthy to see how Cane's filial perception of his students made him go beyond the call of duty. Cane's perception of his student is similar to an asset-based framing approach to work, which is linked to instructors' understanding of students' situations and how this can be leveraged to further their learning [4]. Therefore, the positive perceptions EIF have towards their students and job is critical to enacting change in engineering education.

b. Creatively pursuing solutions for students in resource-constrained environments

Jane is an EIF at a community college. She crafted her role through the use of locally sourced materials in a resource-constrained environment to support her students' learning. She does this by changing her students' perception of what constitutes experimentation in engineering.

> *They get the point of what a stress-strain diagram is better with rubber band than getting intimidated by some huge machine. And so being creative with labs. The point of it and the rubber band lab is actually, there's a lot in there. I have them chemically treated and give them bonus points if they can treat it to strengthen it. And we go through vulcanization and all this. So, you're not losing anything by not using fancy lab. And I know a lot of the universities have gotten rid of their labs because of the expense and it breaks my heart. You do not have to get rid of the labs. You can make labs out of trash. And it's even cooler because half the point of engineering is limited resources. So, we have to learn how to use our trash and how to like... It makes it more fun. We do recycle spaghetti bridge competitions and materials. We did like anything goes and then some people were spending*

a lot of money on their bridges. So, then I changed it back from recycled material bridge to spaghetti bridge. And now we have two kind of classes of bridge for statics but it's physically building something with your hands. That's what people sign up for engineering is because they like legos and they like physically building something and that's... I think every class should have a lab component and that lab component does not have to be expensive. You don't have to break the bank for it. So, we've had a lot of people laugh at us. We have mousetrap cars and all those... Just a 3D printer. You can do so much stuff with a 3D printer and it's goofy but it's fun and it's not intimidating. Yeah.

From our findings, we suggest that the ability of an engineering instructor to pursue creative solutions is key to effective learning for students in resource-constrained environments, like many HSIs. Also, students' perspectives of the "abstractness" of engineering can be changed when instructors use locally sourced materials in teaching. This shows students that engineering is all around us. This in turn can help retention in engineering education.

V. Conclusion

Using the job crafting theoretical framework conceptualized by Wrzesniewski & Dutton [10], this study considered the techniques EIF used in crafting their roles. The key findings show that EIFs craft their roles by changing their tasks boundary, relational boundary, and cognitive task boundary. The desire to support their students' learning is a major determinant responsible for EIF crafting their roles. Some of the implications of EIF job crafting endeavors include student engagement and satisfaction, attraction, and retention of students in engineering. Also, job-crafting could help EIF to reinforce a positive identity at work and contribute to their professional growth. Taken together, we argue that EIF job crafting efforts might be indicative of their attempts at changing the engineering education landscape at HSIs [15]. The findings from this paper could provide insights to support policy formation, structural change, and the design of professional development programs for engineering instructional faculty at HSIs.

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References

[1] H. Salgado, Y. A. U. Cerros, M. R. Kendall, and A. C. Strong, "Faculty Perceptions Of, and Approaches Towards, Engineering Student Motivation at Hispanic-serving Institutions," in *2021 ASEE Virtual Annual Conference Content Access*, 2021.

[2] Y. A. U. Cerros, M. Kayyali, M. R. Kendall, and A. C. Strong, "Motivational factors influencing engineering faculty's pursuit of instructional faculty positions at Hispanic-serving institutions," in *2021 IEEE Frontiers in Education Conference (FIE)*, 2021.

[3] M. R. Kendall, A. C. Strong, G. Henderson, and I. Basalo, "Perceptions of engineering faculty on educational innovation at Hispanic-serving institutions," *J. Women Minor. Sci. Eng.*, vol. 27, no. 6, pp. 21–57, 2021.

[4] V. B. Perez, H. Salgado, A. C. Strong, and M. R. Kendall, "Engineering instructional faculty perceptions of students' background at Hispanic Serving Institutions," in *2021 IEEE Frontiers in Education Conference (FIE)*, 202.

[5] K. A. Adams, *What Colleges and Universities Want in New Faculty. Preparing Future Faculty Occasional Paper Series. Association of American Colleges & Universities, 1818 R Street*. NW, Washington, DC, 2002.

[6] J. M. Berg, J. E. Dutton, and A. Wrzesniewski, "What is job crafting and why does it matter," *Retrieved form the website of Positive Organizational Scholarship on April*, vol. 15, 2008.

[7] C. A. Bodnar, E. J. Mccave, C. Smith-Orr, A. Strong, C. Faber, and W. Lee, "Defining academic engineering education roles within the United States," in *Research in Engineering Education Symposium & Australasian Association for Engineering Education Conference*, 2021.

[8] S. Cutler, A. Kottmeyer, R. Heinen, Y. Xia, S. Zappe, and T. Litzinger, "A holistic assessment of the responsibilities and areas of support of engineering faculty," int. j. acad. dev., vol. 27, no. 1, pp. 96–109, 2022.

[9] L. Earle Reybold and J. J. Alamia, "Academic transitions in education: A developmental perspective of women faculty experiences," Journal of Career Development, vol. 35, no. 2, pp. 107–128, 2008.

[10] A. Wrzesniewski and J. E. Dutton, "Crafting a job: Revisioning employees as active crafters of their work," *Acad. Manage. Rev.*, vol. 26, no. 2, pp. 179–201, 2001.

[11] K. Moitra, "Storytelling as an active learning tool to engage students in a genetics classroom," *J. Microbiol. Biol. Educ.*, vol. 15, no. 2, pp. 332–334, 2014.

[12] D. R. Ilgen and J. R. Hollenbeck, "Job design and roles," *Handbook of industrial and organizational psychology*, vol. 2, pp. 165–207, 1991.

[13] M. Tims, A. B. Bakker, and D. Derks, "Daily job crafting and the self-efficacy-performance relationship," *Journal of managerial psychology*, 2014.

[14] K. Vogt, J. J. Hakanen, R. Brauchli, G. J. Jenny, and G. F. Bauer, “The consequences of job crafting: a three-wave study,” *Eur. J. Work Org. Psychol.*, vol. 25, no. 3, pp. 353–362, 2016.

[15] C. Niessen, D. Weseler, and P. Kostova, “When and why do individuals craft their jobs? The role of individual motivation and work characteristics for job crafting,” *Hum. Relat.*, vol. 69, no. 6, pp. 1287–1313, 2016.

[16] F. A. Bravo, J. A. Hurtado, and E. González, “Using robots with storytelling and drama activities in science education,” *Educ. Sci. (Basel)*, vol. 11, no. 7, p. 329, 2021.

[17] F. J. Muindi, L. Ramachandran, and J. W. Tsai, “Human narratives in science: The power of storytelling,” *Trends Mol. Med.*, vol. 26, no. 3, pp. 249–251, 2020.

[18] A. Strong, M. Kendall, G. Henderson, and I. Basalo, “Impact of faculty development workshops on instructional faculty at Hispanic-serving institutions,” in *2019 ASEE Annual Conference & Exposition Proceedings*, 2020.

[19] J. W. Creswell and T. C. Guertterman, *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*, vol. 6. Saddle River, NJ, 2019.

[20] T. A. Lucey and E. S. White, “Mentorship in Higher Education: Compassionate Approaches Supporting Culturally Responsive Pedagogy,” *Multicultural Education*, vol. 24, no. 2, pp. 11–17, 2017.

[21] K. A. Santora, E. J. Mason, and T. C. Sheahan, “A model for progressive mentoring in science and engineering education and research,” Innov. High. Educ., vol. 38, no. 5, pp. 427–440, 2013.

[22] C. L. Colbeck, “Merging in a seamless blend: How faculty integrate teaching and research,” J. Higher Educ., vol. 69, no. 6, p. 647, 1998.

[23] J. F. Sullivan, S. E. Davis, J. L. deGrazia, and D. W. Carlson, “Beyond the pipeline: building a K-12 engineering outreach program,” in *FIE’99 Frontiers in Education. 29th Annual Frontiers in Education Conference. Designing the Future of Science and Engineering Education. Conference Proceedings (IEEE Cat. No.99CH37011*, 2003.

[24] R. S. Al-Mansoori and M. Koç, “Transformational leadership, systems, and Intrinsic motivation impacts on innovation in higher education institutes: Faculty perspectives in engineering colleges,” Sustainability, vol. 11, no. 15, p. 4072, 2019.

[25] C. Fitzmorris, D. Trytten, and R. Shehab, “The career pathways of non-tenure-track full-time engineering faculty,” in *2018 ASEE Annual Conference & Exposition Proceedings*, 2020.

[26] C. Fitzmorris, R. Shehab, and D. Trytten, “As necessary as the cleaning crew: Experiences of respect and inclusion among full-time non-tenure-track electrical engineering faculty at research-intensive institutions,” IEEE trans. educ., vol. 63, no. 4, pp. 263–272, 2020.

[27] Committee on Closing the Equity Gap: Securing Our STEM Education and Workforce Readiness Infrastructure in the Nation’s Minority Serving Institutions, Board on Higher

Education and Workforce, Policy and Global Affairs, and National Academies of Sciences, Engineering, and Medicine, Minority serving institutions: America's underutilized resource for strengthening the STEM workforce. Washington, D.C.: National Academies Press, 2019.

[28] G. A. Garcia, "Defined by outcomes or culture? Constructing an organizational identity for Hispanic-Serving Institutions," *Am. Educ. Res. J.*, vol. 54, no. 1_suppl, pp. 111S-134S, 2017.

[29] A. Kezar and C. Sam, "Understanding non-tenure track faculty: New assumptions and theories for conceptualizing behavior," American Behavioral Scientist, vol. 55, no. 11, pp. 1419–1442, 2011.

[30] K. Thedwall, "Nontenure-track faculty: Rising numbers, lost opportunities," New Dir. High. Educ., vol. 2008, no. 143, pp. 11–19, 2008.

[31] T. D. Snyder, C. De Brey, and S. A. Dillow, *Digest of Education Statistics, 2017*. 2017.

[32] K. Quardokus Fisher and M. D. Koretsky, "Socially enabled actors: the emerging authorship of fixed-term instructional faculty to enact and sustain organizational change," *High. educ. res. dev.*, vol. 40, no. 6, pp. 1268–1282, 2021.

[33] T. A. Ballysingh, D. D. Zerquera, C. S. Turner, and V. B. Sáenz, "Answering the Call: Hispanic-Serving Institutions as Leaders in the Quest for Access, Excellence, and Equity in American Higher Education," *Association of Mexican American Educators Journal*, no. 3, 2017.

[34] C. Cass, L. Bullard, and A. Vila-Parrish, "Promoting alternative teaching-professor hires: A new PATH for engineering state university," in 2014 ASEE Annual Conference & Exposition Proceedings, 2020.

[35] A. Kezar, "Spanning the great divide between tenure-track and non-tenure-track faculty," Change, vol. 44, no. 6, pp. 6–13, 2012.

[36] A. Kezar, "Departmental cultures and non-tenure-track faculty: Willingness, capacity, and opportunity to perform at four-year institutions," J. Higher Educ., vol. 84, no. 2, pp. 153–188, 2013.

[37] A. Kezar, "Examining non-tenure track faculty perceptions of how departmental policies and practices shape their performance and ability to create student learning at four-year institutions," Res. High. Educ., vol. 54, no. 5, pp. 571–598, 2013.

[38] D. Haviland, N. F. Alleman, and C. Cliburn Allen, "'separate but not quite equal': Collegiality experiences of full-time non-tenure-track faculty members," J. Higher Educ., vol. 88, no. 4, pp. 505–528, 2017.

[39] S. L. Strachan, "The case for the caring instructor," *Coll. teach.*, vol. 68, no. 2, pp. 53–56, 2020.