Motivations for Engineering Faculty Engagement in an Inclusive Pedagogy Program

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Abstract

Although the imperative for inclusive and equitable teaching practices within engineering education has gained significant traction, many engineering faculty members still lack the training and support necessary to effectively implement these practices in their classrooms. Our study addresses this gap through a pioneering year-long inclusive excellence faculty development program designed to enhance engineering faculty members' understanding and application of inclusive and equitable pedagogical approaches.

The year-long program consists of two phases. In the first phase, the faculty participate in a synchronous, weekly training during the spring term. The training curriculum integrates a comprehensive array of topics presented by experts. Curriculum topics include critical pedagogy, structural racism in engineering, inclusive teaching practices, and strategies for advocating for diversity, equity, and inclusion within the current national context. In the second phase, the faculty redesign one of their courses to incorporate the tools and strategies learned during the training and implement the redesigned version of their course in the following academic year. The inaugural cohort, comprising 13 faculty members from diverse engineering disciplines in the College of Engineering, completed phase one in Spring 2024. Phase two will occur in the 2024-2025 academic year.

To guide both our program and research design, we utilize the elements of culturally relevant pedagogies (academic success, cultural competence, and critical consciousness) as a critical lens for training faculty in fostering an inclusive and equitable learning environment and enhancing the educational experiences of students from all backgrounds. Throughout the year-long program, we are conducting longitudinal interviews and surveys to follow the participants' growth trajectories with regards to their understanding and implementation of inclusive pedagogies in engineering classrooms and the impact the program has on cultivating equity-minded practitioners in engineering education. The focus of this paper is the preliminary results regarding the motivations of engineering faculty to participate in this type of faculty development program and significantly redesign one of their courses. We seek to answer the following research question: *What motivates engineering faculty to participate in an inclusive excellence faculty development program*?

Through a qualitative, thematic analysis of the participants' pre-interviews, we found that participants are motivated by a strong commitment to personal growth, student success, community building, and creating broader institutional change. Faculty are particularly driven to make their classrooms more inclusive and while they have a broad understanding of the impact inclusive pedagogy has on students' learning experiences, they are seeking tools and strategies to improve their teaching approaches. However, their understanding of how to integrate critical consciousness into their teaching warrants further development in order to address structural inequities in the engineering curriculum.

Introduction

In recent years, there has been a growing emphasis on the importance of inclusive and equitable teaching practices in higher education [1], [2]. As diversity in student populations increases [3], it becomes imperative for faculty to adapt their teaching methods to create equitable and inclusive learning environments and to adapt their course material to address societal issues. This need is especially pronounced in engineering education, which has traditionally been perceived as a meritocratic field where objective measures of performance overshadow the nuanced realities of diverse student experiences [4], [5]. This perception can inadvertently perpetuate structural inequities, as it overlooks the diverse backgrounds and learning needs of students, leading to disengagement of engineering students [6]. Conversely, inclusive pedagogy involves adopting teaching practices that acknowledge and value the diversity of student experiences, fostering an environment where all students feel respected and supported, particularly those that are historically marginalized [7]. This approach not only enhances student engagement and retention, but also prepares graduates to work in an increasingly diverse and globalized workforce, which is particularly important for the growing diversification of the engineering workforce [8]. However, many engineering faculty still lack the training and support to move beyond traditional pedagogical approaches and effectively embed inclusive teaching in their curriculum.

Faculty development programs are a critical mechanism for enhancing teaching effectiveness (e.g., [9], [10], [11]). These programs aim to equip educators with the necessary skills and knowledge to improve their teaching methods, such as integrating technology, employing innovative assessment strategies, and centering student learning [12]. Research indicates that comprehensive faculty development programs that include workshops, peer and student feedback, and communities of practice can significantly enhance faculty teaching abilities and student learning experiences [13]. In STEM, these programs offer faculty members the opportunity to engage with contemporary pedagogical theories and practices, participate in a multi-disciplinary learning community, practice active learning techniques, and learn how to integrate diversity and inclusion [14]. Specifically, in engineering education, faculty development programs focused on inclusive excellence can help faculty recognize and dismantle systemic barriers to student success, cultivate inclusive classroom climates, and implement equitable assessment strategies (e.g., [15], [16]).

Culturally relevant pedagogy (CRP) emphasizes the importance of integrating students' cultural references into all aspects of learning [17]. Teacher development programs designed to encourage use of CRP help educators create inclusive curricula and adopt teaching practices that recognize and value cultural diversity [18]. Within engineering specifically, it is promising to see that teaching with CRP is expanding within engineering education through university-specific faculty development programs (e.g., [19]).

Understanding the motivations of engineering faculty to participate in faculty development programs is crucial for designing effective initiatives that foster lasting change. In engineering, educators are often driven by a commitment to engaging with students and preparing future engineers [20], a passion for their subject matter [21], and the intellectual challenge of teaching complex concepts [22]. Additionally, many engineering faculty members are motivated by a recognition of the importance of diversity in the engineering field (e.g., [20]) and a commitment to social justice (e.g., [23]), which drives them to create more inclusive classroom environments. However, while research trends indicate interest in studying faculty development, there is limited research on faculty motivations specifically, as indicated by a 2019 search that identified 579 publications for 'faculty + development' but only 87 publications for 'faculty + motivation' [24]. Understanding faculty motivations for engaging in faculty development programs is essential for designing effective faculty development programs that align with faculty interests and institutional goals.

Despite the recognized importance of CRP, there is limited research on the specific motivations of engineering faculty to participate in faculty development programs focused on these inclusive and equitable pedagogical approaches. This paper seeks to address this gap by exploring the motivations of engineering faculty to engage in an inclusive teaching faculty development program. Through this investigation, we aim to provide insights that can inform the design of more effective faculty development initiatives, ultimately contributing to the enhancement of teaching practices and student outcomes in engineering education.

Program Background

Our faculty development program is a year-long initiative designed to train engineering faculty in inclusive teaching practices and culturally relevant pedagogy and to be diversity, equity, and inclusion (DEI) change agents in our College of Engineering community. Specifically, our program has six goals: (1) grow knowledge around specific DEI topics to support the teaching-learning process and students as culturally competent future engineers, (2) build mentorship capacity by connecting faculty with experts in various DEI spaces, (3) embed inclusive and equity in teaching using the Universal Design for Learning (UDL) framework, (4) increase access to DEI-related resources and provide course redesign supports, (5) create organizational change across the College of Engineering to prioritize uncommon voices and create a learning environment where all students feel respected, and (6) foster a cross-disciplinary community of faculty across the College of Engineering acting as change agents for DEI in engineering education.

Conducted in a cohort-based, community of practice [25] model, each cohort of faculty engages in a year-long program consisting of two distinct phases. The first phase, which takes place during the spring term, involves synchronous, weekly, in-person training sessions, led by an instructor. These sessions are designed to provide a comprehensive foundation in inclusive and equitable pedagogical practices, facilitated by experts in the field. Faculty are provided tailored resources on integrating intercultural competence and inclusive teaching practices for their curriculum to facilitate impactful changes in their classes, their departmental units, and across

the College of Engineering. The training sessions are also designed to foster a collaborative learning environment where faculty can share their own experiences and strategies.

The second phase focuses on the practical application of the training received. Faculty members are tasked with redesigning one of their courses to incorporate the principles, strategies, and practices learned during the first phase. The faculty then teach their redesigned course in the following academic year, thus allowing faculty to apply their new knowledge and skills in a real-world teaching context. Throughout this phase, faculty receive ongoing support through both instructor guidance and cohort peer collaboration, ensuring they have the resources and assistance needed to successfully integrate inclusive teaching practices into their curricula.

We launched our first cohort in spring 2024, successfully completing the initial training phase. Currently, participants are in the second phase, actively redesigning and implementing their courses.

Conceptual Framework: Culturally Relevant Pedagogies

To guide both our program and research design, we utilize culturally relevant pedagogies as our conceptual framework. Culturally Relevant Pedagogy (CRP), as conceptualized by Ladson-Billings [17], provides a critical lens for understanding and enhancing the educational experiences of students from all backgrounds. This framework is built on three core principles: academic success, cultural competence, and critical consciousness [17]. Each of these principles plays a pivotal role in fostering an inclusive and equitable learning environment, particularly in fields like engineering where diversity and representation have historically been limited.

The first principle, academic success, emphasizes the importance of ensuring that all students achieve high academic standards [17]. In the context of culturally relevant pedagogy, this means not only helping students meet traditional academic benchmarks but also empowering them to excel by recognizing and validating their cultural identities within the learning process. For engineering education, this principle is vital as it addresses the need to support students from diverse backgrounds in mastering complex technical content while also fostering their confidence and sense of belonging in the field. Faculty members in the development program are learning to modify their courses to better support the diverse academic needs and strengths of their students, thereby promoting higher levels of achievement for all.

Cultural competence, the second principle, involves the ability of students to maintain their cultural identity while achieving academic success [17]. This requires educators to recognize and integrate students' cultural references in all aspects of learning. In engineering, this could involve incorporating diverse perspectives in problem-solving scenarios, acknowledging the contributions of engineers from various cultural backgrounds, and creating a classroom environment where students feel their cultural identities are respected and valued. Faculty members are being trained to make the learning environment more relevant and engaging for students from different cultural backgrounds through facilitating students' understanding and appreciation of their own and others' cultural backgrounds.

The third principle, critical (or sociopolitical) consciousness, refers to the development of a critical awareness among students about societal issues and injustices [17]. This involves encouraging students to question and challenge the status quo and to understand the role of their education in addressing social inequities. In the context of engineering education, this means preparing students to consider the broader impacts of their work on society and to use their skills to promote social justice. Integrating sociopolitical consciousness into engineering curricula can inspire students to develop solutions that are not only technically sound but also socially responsible.

Purpose

Our research's overarching purpose is to evaluate the impact of an inclusive excellence faculty development program on cultivating equity practitioners in engineering education. This year-long program is designed to provide engineering faculty with the knowledge, skills, and support necessary to integrate inclusive and equitable pedagogical approaches into their teaching. The program aims to create a ripple effect that promotes systemic change within engineering education, ultimately enhancing the educational experiences and outcomes for all students, particularly those from historically underrepresented backgrounds.

This paper specifically focuses on illuminating the motivations of engineering faculty to engage in our faculty development program on inclusive excellence. Understanding these motivations is crucial for designing effective faculty development initiatives and for supporting faculty in their journey towards becoming equity-minded educators. Our study seeks to answer the following research question: *What motivates engineering faculty to participate in an inclusive excellence faculty development program?*

Methods

Recruitment

Participants were recruited through a comprehensive advertising campaign targeted at all faculty within the College of Engineering, including teaching-track and tenure-track faculty at all ranks. Interested faculty members submitted a required application detailing their teaching experience and articulating their reasons for wanting to participate in the program. The selection process was rigorous, employing a thorough rubric to evaluate each application based on specific criteria related to the goals of the program, such as teaching frequency, type of course taught, typical enrollment numbers, and how strongly their reasons for participating aligned with the program objectives. Of 16 applicants, 13 faculty members were selected to participate in the inaugural cohort of the program. The three applicants not selected had teaching schedules incompatible with the goals of the program. All 13 program participants consented to take part in our research studying the program, as approved by the IRB.

Data Collection and Analysis

Data collection via pre-program semi-structured interviews conducted with each participant occurred before the training phase (phase one) began. These interviews aimed to establish a

baseline understanding of each participant's motivations for joining the program. The interview questions explored various aspects of motivation, including participants' reasons for applying for the program (elaborating on their application responses), their hopes for supporting their students through their participation, their excitement and concerns about their students' academic experiences, and their top concerns regarding diversity, equity, and inclusion (DEI) in the engineering field. Each interview lasted approximately 30-45 minutes.

The analysis of the interview transcripts occurred in three stages. First, we applied descriptive coding [26] to summarize excerpts regarding the participants' various motivations discussed in the interview with a short phrase that captured the participants' motivation. This process yielded a set of descriptive codes representing the spectrum of motivations across participants for each topic of interest. Second, using the descriptive codes, we explored commonalities across participants by themeing the data [26]. We examined the descriptive codes to generate themes that made meaning of and provided deeper insights into the participants' motivations. Finally, we categorized the themes according to the elements of the CRP framework elements (i.e., academic success, cultural competence, and critical consciousness). This categorization allowed us to discern alignment and identify gaps between the participants' motivations and our conceptual framework and goals for the program.

Limitations

The authors recognize the challenges with conducting an inclusive pedagogy faculty development program within the current national landscape of diversity, equity, and inclusion (DEI) may vary across institutions. Our program is occurring at a university where DEI and other inclusive teaching and learning practices are embraced by the university and College of Engineering leadership. The transferability of our program and research findings to institutions where that is not the case may face different challenges. Additionally, the authors also recognize that the first cohort of faculty participants in our program all self-selected to apply and would likely already be motivated to enhance their learning and teaching with regards to the topics presented in the program.

Results

Overall, the faculty participants are motivated by a strong commitment to personal growth, student success, community building, and creating broader institutional change. Many faculty members are motivated by a commitment to becoming more effective leaders and educators so that they can support their students' academic and professional development. They want to evolve their teaching styles, particularly in response to changes brought about by the COVID-19 pandemic, and to improve their understanding of diversity, equity, and inclusion (DEI) concepts. Faculty are driven by the desire to make their classrooms more inclusive and supportive for all students. This includes giving students tools to be aware of the impact of their projects, motivating students from diverse backgrounds, and ensuring that students feel safe in the classroom. Building a community of equity-minded faculty and learning from peers are also significant motivators. Participants value the opportunity to collaborate with colleagues who share a commitment to DEI and create systemic change within engineering education. They seek

to center DEI as a driver of innovation and to change the mindset that DEI does belong in engineering. Participants showcase a strong desire to be agents of change by turning DEI awareness into action and addressing structural and societal issues within engineering.

Analysis of faculty participants' motivations indicated strong alignment with the CRP framework. Participants have a broad understanding of inclusive pedagogy's impact on creating a classroom environment conducive to supporting all students, regardless of their backgrounds, and ensuring equitable access to opportunities and resources. Faculty aim to support students' learning journeys by addressing their individual needs and barriers. Participants also recognize the importance of cultural competence and aim to integrate cultural awareness into their teaching. They value the incorporation of students' identities and experiences into their curriculum and are seeking tools and techniques to strengthen their approaches. Faculty are also aware of the need to critically reflect on their own teaching practices, motivated by the desire to be change agents with respect to structural and societal issues within engineering, which are concerns for the participants. However, addressing structural inequities in the engineering curriculum requires further development of their understanding of how to integrate critical consciousness into their teaching. Three categories of themes resulted from the analysis of the faculty's motivations and alignment with CRP: (1) Promoting Students' Academic and Professional Success through Equitable Teaching, (2) Fostering Cultural Awareness through Inclusive Pedagogy, and (3) Developing Critical Consciousness for Addressing Societal Impact in Engineering Education.

To protect the identities of the participants, pseudonyms are used and demographic information for each participant is not provided. However, the distribution of the 13 participants is varied across all factors, to include 7 men and 6 women, 5 White and 7 racial/ethnic minorities, 6 teaching track and 7 tenured/tenure-track, and 10 assistant/lecturer rank and 3 associate/full rank. The participants also represent 7 of the 10 engineering departments in the university's College of Engineering.

Theme 1: Promoting Students' Academic and Professional Success through Equitable Teaching

Our analysis reveals that participants are motivated to support their students' academic success by striving for both technical excellence and holistic professional development. Faculty participants emphasized the importance of students demonstrating both their technical expertise and their professional skills, such as teamwork, communication, and leadership. By valuing and integrating these competencies into their teaching, faculty are promoting a more comprehensive view of academic success that is aligned not only with the CRP framework, but also the ABET criteria [27]. This approach goes beyond the traditional focus of teaching engineering technical skills and cultivates well-rounded engineers who can thrive in diverse professional settings. To demonstrate the approach of balancing technical and professional skills in the classroom, Victoria describes her excitement for teaching her students technical communication skills, such as giving presentations, while Jacob has a desire to learn how to fairly grade students in his lab-

based class that work independently rather than as a group, noting that historically students that work independently receive a lower grade.

> *I think what really excites me, going back to your original question, is trying to incorporate not only the didactic, like teaching fundamental ideas, but then also teaching them kind of the soft skills required in academic science. It's actually really intimidating, for example, to give a poster presentation or talk in a good way, and so trying to help them with those things and incorporate that into the curriculum would be really cool. That excites me to allow them to demonstrate those skills. (Victoria)*

> *We do have a lot of labs and…a student cannot finish it in that specific time that we assign. So, they have to collaborate. Usually, groups of 2 or 3 as students should collaborate. And I noticed some students are very good at finding teammates. A student if I assign them to a group, it doesn't matter. I mean, they work on their own. I want to know how I can make it fair at the end of grading what happened. And those students that work independently, they got lower grade than the people that had [collaborated]. (Jacob)*

Another motivation for participating in the program is faculty's focus on growing their equitable teaching practices that prepare students for the future. Participants expressed a commitment to ensuring that all students, regardless of background, have access to high-quality education and opportunities for success. This includes adapting teaching methods to meet the diverse needs of students, bridging gaps in knowledge, and providing support for those who may be disadvantaged by existing structures. However, faculty participants also raised concerns about disparities in access to opportunities, continued gender and racial underrepresentation, and lack of visible diversity in leadership. The faculty participants' motivation to enhance their equitable teaching skills is being driven by their concerns for addressing these issues, for both themselves and within the engineering field, so that all students can excel academically. For example, Samuel expresses his concerns about whether he personally is teaching his students equitably based on their varied prior skills and his concerns regarding students' access to resources more broadly regardless of a student's background or identity. This perspective resonates with the CRP framework's emphasis on academic success being accessible to all students.

> *This I have thought about a lot more as well, that the differences that they are coming in with. I don't think we are handling a lot of, like, we're not trying to get them on the same level of skillset when they're coming into these classes. Many people are coming from under-prepared situations to some people who are over-prepared for this situation. So, the inequity in how I'm teaching, I'm not able to cater to everyone. Because I'm always concerned that, I don't know if it's kind of an ego of mine, or sort of a, what do you call, complexity of mine? I'm worried if I'm catering to the more, brighter students or people who are already prepared for this as opposed to people who may be left behind. So, I'm concerned about my approach to the class, whether I'm teaching to everyone. (Samuel)*

> *I think access to resources, irrespective of who you are. Access to scholarships, access to opportunities, access to internship job opportunities…And in terms of even in experiences*

like a classroom experience. Depending upon your physical abilities, depending upon your backgrounds, there shouldn't be challenges or sort of barriers to how you access the materials, how you access your professors, or TAs. So those there should be improvements there. (Samuel)

Lastly, the findings highlight the faculty's desire to support students' learning journeys by becoming better leaders and educators. Participants recognized that students must be equipped with the necessary tools to success both academically and professionally. By focusing on leadership and student-centered teaching strategies, faculty are working to ensure that every student has the resources and encouragement they need to reach their full potential. Below, Diana describes her desire to use our program to strengthen her leadership skills so that she can better support her students' future success, while Yvonne discusses her plan to restructure the focus of her course to focus on problem-solving skills rather than technical skills explicitly.

Through my work with my students really showing up for them and really supporting their learning journey with us…So I want to make sure that when my students are with us, that we are doing our level best to graduate leaders and world citizens. And in order to do that, I've got to be the best leader I can be. And I've got to understand. What does it take? What is required to be a great global citizen? What does that mean in terms of my country, in terms of my state, in terms of my region? (Diana)

I'm trying to take my class and do the same thing that I would like us to see us do with the curriculum change, which is couch those technical things in a bigger picture of what are the problems we're trying to solve. So, we start with the problems. I haven't ever taught that way. I haven't taken a class that way. I have a constrained piece of, you know, when you're doing the technical skills, there's only so much that a student can learn like that. It's that jump between, okay, how do we then use these terms, these tools we have at the level we've learned them to actually solve the problem. Or to do something, to write a report, do whatever it is. What is it that I have them do that makes them feel that they are able to apply this knowledge to that problem? That's where my gap is, and I'm hoping this activity will help me fill that gap which is my missing link for doing what I want to do. (Yvonne)

These findings indicate that participants are aware of the need to foster academic success through equitable teaching practices. Their motivation for participating in the program is driven by their desire to strengthen their equitable teaching skills to support all students, both academically and professionally.

Theme 2: Fostering Cultural Awareness through Inclusive Pedagogy

Our findings reveal the participants' motivation to increase the cultural awareness of both themselves and their students to create an inclusive classroom environment. Participants highlighted the importance of building relationships where students feel valued and supported, including relationships between themselves and the students as well as relationships between the students. For example, Victoria is motivated by a fear of failing to engage with students in her

classroom after seeing this occur with colleagues, while Sean is motivated by his enjoyment seeing students connect with one another regarding their ideas. This emphasis on interpersonal connections aligns with the concept of cultural competence within the CRP framework, as it focuses on understanding and addressing students' diverse backgrounds and experiences in ways that enhance learning.

> *The concerning thing is just I don't connect with my students. They don't find the course interesting. Or worse, they sign up, they don't drop it, but they don't find the material interesting or useful. And then they just don't engage. And you know, the people that I was talking about before, it's not like they didn't try engaging, like all of it was small group work, and I don't know. It just seems like a lot of people try to engage their students and then just fail. (Victoria)*

> *When I see them bouncing ideas off of each other, I really, I really enjoy watching that. When I see them, you know, we have a spectrum of students in terms of traditional intellectual ability. I guess you would say we have the smarty pants and we have the slackers. And we have a whole bunch of people in between. And what really makes, what I really get a charge out of is, you know, we try really hard when we're coordinating these [team] meetings to make sure, you know, we try to elicit contributions from everybody at the table. (Sean)*

Participants also discussed the importance of recognizing and addressing intercultural differences in the classroom. Participants expressed concerns about effectively adapting their teaching practices to meet the needs of those from different cultural contexts. Teaching within a post-COVID environment was a particular concern, specifically connecting with students who may have experienced varying levels of educational engagement. For example, Natasha is motivated to learn more about her students' experiences and intersectional identities, and how to adjust her teaching accordingly, so that she is doing what is best for them rather than what is best for her. This recognition of intercultural dynamics reflects an awareness of how culture shapes student engagement and learning outcomes, further aligning with CRP's cultural competence element.

> *I think that it will definitely make me more aware of the different experiences that students are going through based on their kind of intersectional identity. There are certain things that I may not have, you know. If I didn't have a student from a certain background, I may not know what type of resources they need, or how I can better accommodate their needs, especially if they themselves don't reach out or speak up. So, I can, I think preemptively I can make sure that the way I'm presenting the material, the way I'm leading the class, it's not just reinforcing kind of my own strength. (Natasha)*

Additionally, participants expressed a growing understanding of the need to address students' identities through inclusive teaching strategies. Several faculty members noted that universal design for learning (UDL) principles can be applied to accommodate diverse learners, especially those who face barriers due to overlapping social identities like race, gender, and ability. Integrating UDL principles and considering students' social identities in teaching reflect a

culturally responsive approach that seeks to make engineering education accessible and relevant for all students, particularly those from marginalized groups. For example, Sean wants to use his participation in the faculty development program to learn how to implement UDL in his class while Dominic is particularly motivated to learn how to support LQBTQ+ students at the university, recounting the results of a recent campus survey. More broadly, Susan wants to ensure that she is appropriately implementing up-to-date inclusive practices, such as using students' correct pronouns.

> *Making the classroom an inclusive place is already a big priority for me. But I feel like I could go farther, and I feel like I might end up getting some insights that I can actually formulate into lesson plans where I can, you know, because I've always known, and even students have held my feet to the fire on this, I've known that well, there's this whole world of inclusive design out there, and universal design that I'm ignoring mostly because I haven't figured out how to work it into the curriculum, and because we don't have very much time, as it is. But yeah, that's kind of my vision for how to use this [program]. (Sean)*

> *The director of the [LQBTQ student center] said a really weird thing, and he said that in their latest survey students actually found, felt that they had a safe space in the [university] in general, except in the classroom. And that's a really interesting question. How can they feel safe in general but not in the classroom? And that's kind of weird. I'm not sure, that's very generic so far, so I'm sure there's a lot to it. But as a whole, I don't, it'd be nice for students to know that they have a safe space in the classroom, too, that the classroom is not unsafe. (Dominic)*

> *There's a huge change. Not 'huge' change. There's been changes that have happened in the last several years. You know, pronoun usage is more formal, is more pronounced or well known. I want to keep up with the times, with those changes, and see if I'm doing, if I'm structuring things correctly, if I'm making students feel inclusive. (Susan)*

These findings indicate that participants are beginning to adopt culturally aware practices in the classroom, for both themselves and their students, to improve their inclusive pedagogy. However, there is a desire for further engagement with these principles to fully integrate cultural competence into their pedagogy.

Theme 3: Developing Critical Consciousness for Addressing Societal Impact in Engineering Education

Our analysis shows that participants are beginning to engage with the critical consciousness element of CRP, both through engaging their own critical consciousness as well as that of their students. Faculty participants expressed a motivation to show students that engineering is not just about technical problem-solving, but also about applying their engineering skills to real-world problems. However, they also voiced concerns about the relevance of the engineering curriculum in addressing contemporary societal issues. Several faculty members noted that traditional engineering curricula often overlook pressing challenges related to social justice, environmental

sustainability, and equity. Faculty members are beginning to explore how their courses can contribute to students' understanding of these issues and their ability to take action as engineers. For example, Natasha indicates her excitement to elevate the relevance of her curriculum, while Monica appears overwhelmed with the task. This motivation aligns with the CRP framework's goal of fostering critical consciousness by empowering students to connect their education to their lived experiences and societal needs.

> *Some things that I get really excited about as an instructor is showing them the relevance of the material they're learning beyond why they thought they were taking the class. So oftentimes students come in with a very kind of narrow perspective on why they have to take the course. Either it's just to graduate or get units or throw something on their TV, or they want to learn one specific skill for applying for a job, and so on. But I want to demonstrate to students that the topics that I'm teaching could be relevant more widely in their everyday lives, or help them think more broadly about their career opportunities. (Natasha)*

> *It's maybe becoming more prevalent now where the younger generations are thinking more about how very real these climate change impacts are. Like, it's happening now. What's that? A future problem? And we need to really rethink the way that we structure our societies and live and work together. And so, they're looking for that kind of content in their classes. And I don't think we're meeting that need, because we are still very concerned about like, well, we're going to graduate as an engineer, you gotta learn these equations. And you have to know these principles. And like, sure, yes, that's true for a lot of current and future industries that you're going to have to learn those skills and apply them. But if we're trying to, you know, build these bridges across all these different spaces, then we need to be really mindful about adding new classes, or changing existing classes, which I know nobody wants to do, because it's an insane amount of work. That's, I think, another concern that I have too. (Monica)*

Faculty are also driven by their desire to be change agents by turning their DEI awareness into action and are motivated to use our program as a catalyst for doing so. For example, Ted wishes to utilize the program to learn how to turn their own awareness into action, while Vince would like to use the program to reflect on the areas of teaching he needs to improve and using data-driven research to make changes. The faculty participants are demonstrating an initial awareness of their role in cultivating engineers who are not only technically proficient but also critically aware of how their work intersects with larger societal problems.

> *I think I'm aware of these things. But I'm aware and you can read about them, but then, how do you actually implement, to develop or find the tools and implement them in your class, in your curriculum, so that you're actually addressing these things? And it's not just, 'oh, I've read books, and I've read papers, and I've participated in workshops,' and things like that. But I want to be able to, you know, be a force for positive change. (Ted)*

Well, this class again helps me figure out some of the some of the holes or some of the unknowns that I've seen over the past years in my teaching that I haven't been able to really pay attention to enough, or it's been difficult to address, because I don't know how to address it, and I can't find good evidence of research. Or it's been, I guess I know how to fix it, but it's just hard to do it. So, this class actually provides that structure and that motivation to do it. So that's my hope. (Vince)

Lastly, the participants emphasized the value of learning from others within the cohort to drive change within their own disciplines and across the College of Engineering. They mentioned their excitement around how engaging in cross-disciplinary conversations will broaden their perspectives on inclusive and equitable pedagogy. For example, Victoria describes her excitement to learn from the experiences of other faculty to determine new practices she would like to incorporate in her course.

I really look forward to kind of the discussion from the other faculty. I think we already have really great discussions from hearing from very seasoned professors. And I just absolutely love that because I just want to absorb everything...I think everyone in that room is to me an instructor, because they're teaching me so much and sharing documents and things like that. So, I think, you know, I feel like I already want to incorporate some of their practices...Because some things I've thought about, but not really formally or haven't really heard how it's worked for other people. So, I think it's a really great place to get ideas. (Victoria)

Overall, our findings suggest that participants are beginning to integrate critical consciousness into their teaching and are aware of the need to connect the engineering curriculum to societal issues. The participants are motivated to participate in our faculty development program to have the time and space to critically reflect on their inclusive teaching practices and make their curriculum more relevant.

Discussion

Our faculty participants are intrinsically motivated to seek out professional development related to inclusive pedagogy and are particularly motivated to support the growth and learning journey of their students. They have a desire to create inclusive and equitable learning environments, enhance the relevance of their curriculum to connect engineering education with societal issues, and ensure all students have the tools to success both in their classes and within their professional careers. Faculty participants' motivation to better support their students' academic and professional development aligns with existing research that shows engineering educators often struggle to reconcile the traditional focus on technical rigor with inclusive practices that support diverse learners [28]. Our results suggest that faculty are not only wanting to prioritize student academic success but are also motivated to adopt practices that promote future professional success in diverse engineering careers and workplaces.

Our findings also emphasize faculty's desire to engage and make connections with students through understanding their identities and recognizing their cultural differences, with the goal of creating inclusive learning environments. Recognizing intercultural differences reinforces existing literature that indicates its importance in establishing inclusive learning environments [18]. Further, participants are interested in specifically learning how to implement universal design for learning (UDL) principles and practices to engage all learners in their classroom. While UDL was initially developed in the 1990s as a means to support accessibility of learners with disabilities [29], [30], [31], it has become a critical part of the national education public policies to meet the diverse needs of all learners [32]. In the last 10-15 years, its use as an inclusive teaching method is expanding [33], particularly in postsecondary STEM education [34].

Our faculty participants are also motivated to connect engineering content to broader societal issues and to enhance student awareness of their roles as engineers in addressing these issues. Using the program to reflect on their own awareness and actions and conversing with colleagues is an important first step to facilitating conversations with students. Critical consciousness is increasingly recognized as vital for preparing engineering students to address societal challenges [35], [36]. While the literature advocates for integrating all three elements of CRP (academic success, cultural competence, and critical consciousness) holistically [17], our faculty participants appear to focus more on academic success and cultural awareness, with critical consciousness being less developed. The relative underemphasis on critical consciousness might stem from discomfort or a lack of experience with discussing sociopolitical issues in traditionally technical disciplines [5], [37]. However, this indicates a potential area of growth in training engineering educators to intentionally grow their own and their students' critical consciousness within their engineering courses.

Conclusion and Future Work

Our preliminary results indicate a promising shift towards more inclusive and equitable practices in engineering education at our university. The faculty participants are motivated by a strong commitment to personal growth, student success, community building, and creating broader institutional change. While we are in the first phase of our inclusive excellence faculty development initiative, we are excited about the potential impact on our faculty participants and their students, including their academic and professional success, cultural awareness, and critical consciousness. Our future work will consist of a longitudinal analysis to assess how faculty's inclusive teaching practices evolve over time, particularly after they redesign and implement their courses based on the training received. We plan to also gather data on the student experiences in the redesigned courses to understand how students perceive and benefit from the inclusive practices. We also hope to assess how the program participants act as change agents, such as through teaching their peers what they have learned, to create broader institutional changes within their departments and across the College of Engineering. The future analysis and long-term impact of the program have potential for fostering an environment where diversity, equity, and inclusion are integral to the academic and professional growth of both faculty and students.

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