Work in Progress: A Collaborative Reflection Exploring the Teaching Motivation and Identity Development for International Graduate Students in Engineering

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Abstract

This work in progress paper uses collaborative reflection to begin exploring the contextual factors that influence the teaching motivation and identity of international engineering doctoral students. In this paper, the first two authors are international doctoral students who reflect on their first formal teaching experiences and their journey toward developing interests in engineering education careers. Sruthi (First Author) explores her experience as an international student from India teaching in the United States, while Anyerson (Second Author) examines his teaching experience in his home country of Colombia. Our review of the literature on the experiences of international graduate students found that prior work has primarily focused on understanding their sense of belonging and acclimation to higher education settings in the United States. And yet, their teaching motivation and identity as international graduate students have been underexplored. Expanding on existing work that examines intrinsic factors of motivation (autonomy, competence, and relatedness) for graduate teaching assistants in engineering, we analyzed written reflections and discussions about our personal experiences to begin uncovering the extent in which our cultural identities play a role in our self-determination to pursue careers in engineering education. The outcomes of this paper will lead to insights informing a future paper examining how international graduate students navigate hidden curriculum of teaching environments in the United States. Broadly, the goal of this work is to identify contextual factors that motivate international graduate students to pursue teaching in engineering, while also fostering their retention and engagement in the field.

Introduction

The professional identities of international doctoral students pursuing engineering degrees in the United States (U.S.) are shaped by a multitude of experiences through their academic journey. Their experiences are influenced by learning to navigate a foreign educational system while also negotiating their own cultural backgrounds in the process. Existing studies have indicated that international students grapple with their experiences of adjusting to a new culture, managing language barriers, and challenges with feelings of belonging within their academic environments [1], [2], [3], [4]. However, there remains a notable gap in understanding how the cultural identities of doctoral students influence their professional development experiences, such as graduate teaching roles. As such, this collaborative reflection between the first two authors aims to explore their teaching motivation and identity development through the lens of their cultural identities and formal teaching experiences. This work is guided by the research question: *How do cultural identities influence the self-determination of international doctoral students in engineering to pursue careers in engineering education?*

Background

Teaching experiences are an integral part of the professional development of graduate students in engineering. Research on graduate students' experiences reveals that engaging in teaching

practices can influence the professional development of graduate students [5]. This engagement has been shown to enhance communication skills [6], [7] as well as facilitate self-efficacy to teach [8], [9]. Engaging in teaching as a graduate student also contributes to building relationships with faculty and peers, which fosters an environment conducive to retention and mentoring [6], [10]. Graduate teaching participation and requirements can vary across programs and institutions. One of the most common funding options for graduate students is through teaching assistantships [11], [12]. However, in some programs participating in a teaching assistantship can be discouraged to prioritize research productivity and development [13]. Due to these varied requirements and the emphasis on research in graduate programs, there is a general lack of formalized preparation around teaching for graduate students [14]. To better prepare graduate students for their teaching assistantships and to fully leverage the potential of these professional development opportunities, it is necessary to understand the current landscape of research on graduate teaching assistants across disciplines and within engineering.

As graduate students assume graduate teaching assistant positions, they often struggle balancing their responsibilities as students and researchers, all while navigating the tasks associated with teaching such as managing activities, employing instructional methods, and addressing student needs. For international GTAs in the U.S., these struggles can be exacerbated as they seek approaches to reconcile the cultural differences between themselves and their students. Prior studies have focused on investigating different aspects of GTAs in the university setting, such as the impact of training programs on GTA development [15], [16]. Other researchers have focused on navigating the process of becoming a GTA, addressing motivation [17], and specifically for international GTAs, research on cultural barriers and experiences [18], [19] and balancing of roles. However, our preliminary review of the existing research on international GTAs across disciplines and western nations revealed a focus on communication and adaptation challenges in teaching experiences [18], [20], [21]. Yet, it highlights a scarcity of research in engineering education specifically exploring the factors that motivate international engineering graduate students to pursue careers in academia, particularly in a context where formalized preparation for these roles is not common. This gap in research has implications beyond preparing graduate students in their teaching assistantship roles. Without insights into the factors supporting graduate students' teaching motivation and identity, we risk minimizing efforts to broaden participation and diversify academia in engineering.

The exploration of motivations and career pathways among international GTAs and faculty reveals critical insights into their significant role in diversifying faculty across U.S. institutions. Prior work indicates that international GTAs are motivated by a blend of intrinsic and extrinsic factors, including the opportunity for personal and professional growth, a strong desire to teach, and the need for relatedness, which they fulfill through interactions within their institutional environments [22], [23], [24], [25]. In terms of their career trajectories in the U.S., Mamiseishvili [26] revealed that foreign faculty often find themselves in roles that utilize their technical expertise or cultural knowledge, indicating a unique perspective where they harness their personal backgrounds. However, applying their unique cultural backgrounds and experiences effectively can be challenging within American classrooms because of the existing cultural differences. Ismail and Groccia [27] mention that challenges with cultural differences can impact teaching effectiveness but can improve over time with experience and growing awareness of American culture. This underscores the need and opportunity to leverage teaching experiences

during graduate school as a platform for aiding international graduate students in gaining awareness of their cultural identities and understanding their influence on learning outcomes in teaching environments. To prepare graduate students more effectively for these experiences, this work-in-progress paper begins by exploring what motivates existing international students towards teaching professions and how their readiness for these roles is formed. By expanding on these insights, we can not only facilitate their progression towards academic careers but also enhance the academic landscape by creating a cultural and environment in engineering that values of the diverse perspectives of all its members within U.S. higher education institutions.

Theoretical Framework

Our qualitative work-in-progress study is theoretically grounded in Ryan and Deci's [28] Self-Determination Theory (SDT). We selected SDT as a result of the authors' early discussions about the development of our teaching identities. The role of our cultural backgrounds in the development of our respective teaching identities was common throughout our experiences, and our interests in pursuing engineering education careers were rooted in our intrinsic motivation to become educators. As such, we employed SDT as a framework for our work. SDT is defined as a means of examining human motivation and behavior toward growth tendencies, and posits that human psychological needs of autonomy, competence, and relatedness can be a source of motivation in domains of interest [28]. We used this framework to examine how the cultural identities of the first two authors influenced the factors of self-determination during their first formal teaching experiences. The framework was used to inform our data collection and analysis approach, which will be discussed later in the paper.

Positionality

Sruthi: I grew up in a middle-class family in India and chose to pursue civil engineering for my undergraduate studies at a university in my hometown in India. Seeking to deepen my expertise in drinking water sustainability, I moved to the U.S. for a master's in environmental and ecological engineering at a large R1 midwestern, public, predominantly white institution (PWI). I am now a doctoral student in the same field at the same institution. My first formal experience in a teaching role was as a graduate teaching assistant in the United States. I have about five years of experience co-teaching undergraduate science and engineering courses throughout my graduate studies. I also served as a supervisor for teaching assistants in a team-teaching setup for one semester. I was motivated to take courses in the Engineering Education department at my institution to become a more effective teaching assistant and to engage with others who had interests in furthering engineering education research. This enriched my pedagogical skills and steered my career aspirations towards teaching-focused positions in STEM programs.

Anyerson: I was raised in a low-income family in Colombia. I pursued a degree in mechanical engineering at a public university in Colombia, and before finishing my bachelor's degree, I worked as a mechanical engineer for Colombian companies. During that time, I started my master’s in Materials and Processes and started teaching before graduating as a Lecturer. I worked as a lecturer for four years, and then I followed my desire to continue my post-graduate studies. I moved to the U.S. to start my Ph.D. in Engineering Education at a large R1 midwestern

public PWI. My career aspiration is to pursue a full-tenure track teaching position in engineering and continue researching on teaching and development at the university level.

Sruthi and Anyerson: As international students in the U.S. we bring unique perspectives to our teaching, emphasizing inclusive and engaging methods to support diverse student populations. Our approach to education is rooted in the belief that learning is a transformative process, requiring patience, empathy, and a commitment to continuous improvement. Together, we strive to not only impart knowledge but also to inspire and support our students to become thoughtful engineers ready to face future challenges, thereby contributing significantly to the development of engineering education.

Methodology

Our study utilized a collaborative reflection methodology (CRM) [29]. CRM is a process that involves more than one researcher coming together to reflect on experiences for examining their teaching with different viewpoints [29], [30], [31] to understand the implications of their teaching on personal experiences, classroom problems, approaches, skills, advantages, and disadvantages of the context [29], [31], [32]. We used CRM to explore how our cultural environments of teaching experiences impact the development of teaching identity for engineering doctoral students. More specifically, we examine how we navigated the cultural environments of our first formal teaching experiences through the lens of our cultural backgrounds, reflecting on our cultural sameness or difference and its impact on our teaching identity. Sruthi's first formal teaching experience was in the United States, a cultural environment different from her Indian cultural background and lived experiences. Anyerson's first formal teaching experience was in his home country, Colombia, where elements of cultural sameness were salient in his teaching experience. We generated reflections on our personal experiences, developing a teaching identity focusing on how the cultural environment shaped our teaching practice, beliefs, and attitudes. Our approach involved responding to a series of reflective prompts (Table 1) generated by Amena (the Third Author). These prompts were designed to elicit insights into our teaching philosophy, personal experiences, and motivations, addressing the factors of SDT: autonomy, competence, and relatedness. Amena's primary role was to guide and support the design of the data collection and analysis approach, engage in peer debriefs about the data, and provide feedback on the findings and analysis.

Data collection

The first phase of our data collection was individually answering the series of written reflection prompts in Table 1. The second data collection phase was multiple online and in-person meetings between Sruthi and Anyerson to discuss their written responses to the prompts. These discussions were semi-structured, where the written responses guided the discussions but were not limited to their contents. This multi-method approach to data collection provided a comprehensive and nuanced way of exploring and processing our teaching experiences as doctoral students.
Table 1 presents the overarching questions framed by SDT. These questions informed follow-up questions that guided authors' contemplations regarding their cultural identity, authenticity in teaching, and the impact of cultural dynamics on their professional experiences and self-perception as educators.

Table 1. Overarching questions used in data collection

		Cultural Alignment with Cultural Environment
Factors of Self-Determination	Autonomy	How does cultural (sameness/difference) influence your ability to feel empowered or in control in making decisions/choices within your teaching role?
	Competence	How does cultural (sameness/difference) influence your ability to feel you have the knowledge, skills, and abilities to perform your teaching role?
	Relatedness	How does your cultural (sameness/difference) influence your ability to build and feel connection or belonging with your students, peers, and faculty in your teaching role?

Data analysis

Our analysis of the data commenced with initial open coding, followed by several rounds of review. This iterative process facilitated the categorization of codes and the refinement of themes. These themes were then examined within the framework SDT, enabling a structured exploration of intrinsic and extrinsic motivations in teaching practices. The validity and quality of the analysis were further enhanced by the contributions of Amena, whose expertise provided valuable insights into the phenomena under study. This collaborative approach ensured a rigorous examination of the data, leading to meaningful conclusions about the interplay between cultural identity and teaching experiences.

Preliminary Results

The following section presents the preliminary results addressing our research question: *how do cultural identities influence the self-determination of international doctoral students in engineering to pursue careers in engineering education?* With this paper being a work-in-progress, in this paper we focus on the results of our early analysis of our data collection sources. Our preliminary results are organized by each factor of self-determination where we define the factor (autonomy, relatedness, and competence) followed by presenting personal quotes and descriptions that capture our experiences as it pertains to the factor. We examine how Sruthi and Anyerson utilize their unique cultural perspective to enable self-determination in their teaching experiences.

Autonomy: In our exploration of autonomy in teaching, defined by Chambers et al. [33] as "having choice and empowerment within an environment," we closely examined how Sruthi and Anyerson make choices in their teaching to utilize their cultural backgrounds as a means of enhancing their pedagogical practices.

Sruthi found that she uses her cultural background and experiences as a pedagogical tool. One way she does this is by using classroom discussions as an opportunity for students to share their own lived experiences as they relate to the topic of study. She encourages the exchange of cultural experiences in the classroom, enhancing the learning environment by fostering mutual respect and understanding among diverse students:

"I encourage students to bring their cultural experiences into the classroom, creating a diverse blend of perspectives that enhances learning for everyone. This approach has helped me create a classroom atmosphere that is not just about transferring knowledge, but about shared learning and mutual respect." - Sruthi

"I aim to balance my cultural identity with educational insights for my students. In our discussions on global challenges such as water treatment, I highlight the contrasting infrastructures between the United States and India. For instance, I explore how even small towns in the United States benefit from advanced piped water systems that ensure safe, potable water directly from the tap. In contrast, many remote areas in India rely on non-piped water sources, where water safety and accessibility are major concerns. By examining these differences, we not only learn about engineering and public health but also align our discussions with the global sustainable development goals, fostering a deeper respect and understanding for the diverse solutions and struggles that shape lives around the world."- Sruthi

Sruthi finds that striving for this balanced integration of cultural identity and heritage into her teaching serves as a valuable resource in her teaching methodology, enriching the learning experience while allowing her to remain authentic, saying:

"My cultural background has also instilled in me a deep appreciation for storytelling, which I often use as a tool to make complex engineering concepts more relatable and understandable. This integration of my cultural identity not only enriches the learning experience for my students but also keeps me grounded and authentic in my teaching practice." – Sruthi

For Sruthi, navigating cultural differences involves not only leveraging her background as an educational tool but also managing potential misunderstandings or misalignments between her teaching style and her students' learning expectations. This dynamic offers a rich opportunity for cross-cultural learning but requires careful balance to ensure inclusivity and respect for all perspectives.

Anyerson, as a lecturer in his home country, enjoyed greater autonomy in teaching, allowing him to focus more on learning outcomes and enhancing his skills within his familiar cultural context, saying:

"I understand that I have a responsibility to learn for my students. To do that, I always look to enhance my teaching, modify slides, understand the topics better, and explain those with accessible language. These elements I consider critical from my experience in the same setting as an undergraduate." – Anyerson

Anyerson leveraged his cultural insight to tailor his teaching approach, addressing students' needs and bridging educational gaps, thereby enhancing the learning experience, saying:

"I must say that teaching is a challenge in itself. I need to understand the topics and adapt those topics for my students. To do so, I am aware of my students' ages, backgrounds, and kinds of families, what they would need (economic support? Psychological support? Food support?), and which events have happened in the past regarding the different cultures in my country." – Anyerson

For Anyerson, cultural sameness with his students and teaching environment provided a shared understanding that streamlined communication and learning processes. However, through reflection on his experiences with Sruthi, he recognized that it might also lead to assumptions about shared experiences or knowledge that are not true for all students, potentially overlooking the diversity within seemingly homogenous groups.

These individual experiences shed light on the broader conversation about autonomy in teaching, particularly for TAs in higher education settings in the United States. As classrooms become more culturally diverse, the autonomy given to TAs and instructors becomes crucial in shaping curricula that are responsive to this diversity. Understanding and leveraging cultural differences and sameness can lead to more effective and empathetic teaching strategies, ultimately enriching the educational experience for both teachers and students.

Relatedness: Relatedness is defined as the feelings of belonging or connecting with colleagues, students, faculty, and other actors in the academic community [17].

Sruthi actively sought and found support for her teaching skills in a culturally diverse environment, enhancing her connection to her role and improving her teaching abilities. She found community with other students and faculty who were also interested in engineering education, which helped her enhance her teaching approaches. These connections furthered her own professional development, allowing her to take courses in engineering education and gain access to resources that supported her growth:

"Throughout my teaching career, I've encountered various supports and barriers that have shaped my experience. Key supports include access to professional development resources, a network of supportive colleagues and professors, and an institutional environment that values and fosters educational excellence. These supports have been instrumental in my growth and success as an educator" – Sruthi

Additionally, Sruthi emphasizes the importance of authenticity in her teaching, believing that being genuine helps establish trust and better connections with students. In reflecting on her experiences, she found that an authentic approach to teaching was particularly relevant in the multicultural environment she teaches in, where cultural identities amongst members in the classroom can help foster an atmosphere of openness and understanding:

[Regarding Authenticity] "It means bringing my whole self to the classroom, including my cultural heritage, values, and experiences. This authenticity helps me establish a genuine connection with my students and creates a trusting environment where open and honest communication is encouraged. When the environment is open and honest, students feel safe to engage in the learning process and ask questions without judgement." – Sruthi

Within a teaching environment of cultural sameness, Anyerson felt that he connected with students differently than Sruthi. Looking back at his teaching experience, he remembers connection with students was grounded in implicit cultural norms that emphasized the role of authority and age hierarchy in building student relationships:

> *[Regarding connection with students] "My age at the moment of starting teaching also helped me, and I saw physical differences between students and myself, which is in some way important in Colombia because of the age hierarchy. Also, I noticed that young teachers struggled more with their students, and their way of connecting with students was not always well received by students." – Anyerson*

When it came to connections with faculty and peers however, being in a culturally homogeneous setting offered Anyerson the advantage of connecting with faculty through informal teaching communications, which plays a significant role in understanding his teaching role [34]:

> *[Regarding connections with faculty] "I always counted on my thesis directors to discuss some things about student interactions, cultural awareness, rules of the university, and the strategies they use. (They were my professors during my bachelor's, too. Although I have some opinions about their teaching, I consider their opinions and experiences valuable)." - Anyerson*

Sruthi's and Anyerson's experiences underscore the importance of cultural sensitivity and adaptability in building relatedness, particularly in academic environments where diverse backgrounds converge. Navigating these dynamics effectively not only enriches the educational experience but also strengthens the academic community by fostering inclusivity and mutual understanding.

Competence: In the context of educators for our study, competence refers to the mastery of both the subject matter (the "what") and effective teaching strategies (the "how") [35]. This dual proficiency ensures that educators can deliver high-quality education, which is essential for preparing future engineers with the necessary foundational knowledge and skills.

Sruthi, facing cultural and linguistic challenges as an international teaching assistant, developed strategies to enhance her teaching effectiveness. Recognizing the potential distraction her accent might cause, she adapted her speech and employed visual aids to ensure her students remained focused on the concepts rather than her accent. This approach allowed her to maintain the integrity of her content while ensuring clear communication, demonstrating adaptability and commitment to overcoming barriers in a diverse educational setting.

> *"When faced with language barriers, I have employed various communication strategies, such as using visual aids, adapting to a new accent (not to feel some kind of belongingness, but to not have to repeat myself and distract the younger student I am trying to teach!), and simplifying language without diluting content." – Sruthi*

However, in discussing the collaborative reflections, the authors also discussed how Sruthi feeling the need to adapt her accent for her students is an example of where linguistic diversity in engineering classrooms should be celebrated rather than suppressed. Sruthi did not feel that she was adapting her language to assimilate to her surroundings, however, her experience shed light to the experiences of other international students and faculty who navigate unique challenges as a result of accents and language differences. In comparison, Anyerson did not have that challenge during his formative teaching experience. With him sharing the same language and accent as his students and peers, Anyerson did not need to consider language in his teaching. When reflecting on language with Sruthi, it highlighted to him how being culturally and/or linguistically different adds a different layer of stress to teaching:

> *"Being in my own culture at the beginning of my teaching journey, I think, was critical to develop my teaching skills without adding additional stress as other languages and other cultures. Teaching is sometimes stressful when we do not have preparation before starting. I surpassed the process and understood the role by myself." – Anyerson*

Sruthi 's challenges led her to innovate in creating cultural awareness in her classroom, turning obstacles into opportunities for enriching the educational experience with diverse perspectives.

> *"In overcoming cultural misunderstandings, I've learned to be more empathetic and patient, taking the time to understand different perspectives and finding common ground. These experiences, both supportive and challenging, have contributed to my development as an educator and have equipped me with the skills to navigate a diverse educational landscape." – Sruthi*

While Sruthi navigated cultural barriers to maintain her teaching competence, Anyerson had the ease of teaching within his own cultural context. This contrast shows that while cultural similarities can ease the teaching process by removing stressors like language differences, navigating cultural differences can foster growth in humanistic skills and pedagogical strategies, enriching the learning environment for both the educators and the students.

Conclusion and Future Work

International students bring a wealth of diverse perspectives and teaching methodologies to higher education in the United States, significantly enriching the educational landscape and fostering a more inclusive learning environment. Our CRM underscores the influence of cultural backgrounds and even prior teaching experiences on the teaching motivations of international graduate students. Our next steps involve developing a collaborative autoethnography study to characterize the unique challenges and opportunities that international graduate students in engineering face as they navigate the complex landscape of higher education in the United States as graduate teaching assistants.

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