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# THE CHALLENGE OF POSTDOC'ING IN THE US: PERSPECTIVES FROM INTERNATIONAL ENGINEERING POSTDOCTORAL SCHOLARS (RESEARCH-PRACTICE)

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## ABSTRACT

An intrinsic case study explores the challenges shared by international engineering postdoctoral scholars about working in the United States (US). Little research has been devoted to their experiences despite their stark increase in the postdoctoral labor force over the last decade. Semi-structured interviews were conducted with eight engineering postdoctoral scholars hailing from Canada, China, Colombia, Iran, Italy, and Thailand. Participant interviews were analyzed inductively and resulted in four themes: (1) Immigration concerns; (2) Strains to find a community; (3) Pressure to publish and secure funding; and (4) Inadequate career counseling. The identified themes could be particularly instructive to Ph.D. advisors outside the US whose students may pursue postdoctoral positions in the US, Ph.D. recipients, US postdoctoral advisors, and US college and university international offices.

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# **1 INTRODUCTION**

## **1.1 Overview**

Understanding the challenges shared by international engineering postdoctoral scholars about working in the United States (US) may be critical to ease the difficulties they experience and to support their career success. Over half of science, technology, engineering, and mathematics (STEM) postdoctoral scholars in the US are from abroad (Camacho and Rhoads 2015); therefore, focusing on their challenges will greatly benefit the American postdoctoral labor force. An intrinsic case study design is employed to inductively explore interviews conducted with eight international engineering postdoctoral scholars. The research question guiding this study is: What challenges do international engineering postdoctoral scholars experience in the US?

## **1.2 Literature Review**

Postdoctoral positions are increasingly considered necessary for STEM Ph.D. recipients seeking tenure-track faculty positions (Yadav and Seals 2019). As academic positions have declined, the volume of postdoctoral positions has increased. International Ph.D. recipients are attracted to postdoctoral positions in the US due to the high caliber of research occurring in the US (Cantwell 2011) and the availability of positions (Lee 2013). Employing international postdoctoral scholars diversifies American academic ranks and furthers world-class research (Cantwell and Taylor 2013). Considering international scholars comprise a substantial part of the US academic labor force, understanding their challenges is essential.

Before setting foot on US soil, international postdoctoral scholars must secure a work visa to be employed in the US (Ukachukwu et al. 2022). While American colleges and universities have relative flexibility in sponsoring H1-B visas for skilled immigrant workers in specialty areas and J1 exchange visitor visas, international postdoctoral scholars may not be aware of the differences in the purpose, eligibility, and requirements of these visas (Cantwell 2011). For instance, H1-B visas can be renewed and may lead to a green card, but individuals working under a J1 visa must return to their home country for at least two years before applying for a green card or re-entry. The complexity of the visa process is quite significant and could have consequences on a future career in the US (Ukachukwu et al. 2022).

While navigating US immigration policies and work visas is a considerable challenge, transitioning into the workplace can be even more difficult. International postdoctoral scholars report the highest rates of harassment of any postdoctoral scholars in the labor force (Woolston 2020). This discrimination frequently results in these individuals being placed at lower tiers of the academic labor force, limiting their ability to successfully transition to faculty positions (Lee 2013). Additionally, they report experiencing stigmatization, microaggressions, institutional barriers, lack of mentors, and negative messaging about their abilities (Karalis Noel et al. 2022).

International postdoctoral scholars also report a lack of transitional support, which diminishes their professional and career success. One central area of need is to

further develop their academic English skills in oral and written communication (Ferguson et al. 2017). This is not surprising, as most postdoctoral scholars identify the need for more support in writing grants, journal articles, and technical reports (Nowell et al. 2020). International postdoctoral scholars also express difficulties in finding a supportive disciplinary and peer community in which they feel they belong (Karalis Noel et al. 2022). These feelings are worsened by unresponsive supervisors with misaligned work expectations and differential treatment of international and domestic postdoctoral scholars (Karalis Noel et al. 2022).

While international postdoctoral scholars face work-related difficulties in the US, institutionalized resources are in place to offset their challenges. For instance, most US colleges and universities have an international office to provide visa assistance, English language classes, and academic and career support (Ferguson et al. 2017). However, it is argued these support structures are woefully lacking, and more help is needed in navigating US immigration policies, filing US taxes, accessing healthcare benefits, improving English communication skills, and career networking (Gunapala 2014). Organizations such as the National Postdoctoral Association (NPA) provide postdoctoral advocacy seminars, collaboration and leadership opportunities, and career planning assistance to address these gaps. Although these resources are beneficial, few international postdoctoral scholars are familiar with or take advantage of them (Ferguson et al. 2017), despite researchers finding they are more likely to attend professional development and networking opportunities than their US peers (Nowell et al. 2020). Thus, a deeper understanding of their challenges and ways to ease them is needed to better support international postdoctoral scholars in the US.

## **2 METHODOLOGY**

### **2.1 Research Design**

An intrinsic case study (Stake 1995) was utilized to explore the challenges shared by international engineering postdoctoral scholars about working in the US. Intrinsic case studies are valuable when seeking to provide insight into a particular issue in which the case is secondary. Interviews conducted with eight international STEM postdoctoral scholars were analyzed inductively (Silverman 2019). The research question that guided this study was: What challenges do international engineering postdoctoral scholars experience in the US?

### **2.2 Participants**

Fifty STEM postdoctoral scholars were recruited from the NPA via an email alert, although this inquiry analyzed the interviews of only the international engineering postdoctoral scholars. Participation was incentivized with a \$25 e-gift card. The sample comprised a diverse group of engineers; three self-identified as female and five as male, and the ages of the participants ranged between 34 to 46 years. The postdoctoral scholars were from Canada, China, Colombia, Iran, Italy, and Thailand. Specific sub-engineering disciplines are not included to aid in masking participants' identities. A summary of participant demographics is listed in Table 1.

Table 1. Participant Demographics

Pseudonym	Gender	Age	Home Country
Abeo	Male	36	Canada
Angela	Female	35	Colombia
Armando	Male	46	Colombia
Camila	Female	43	Italy
Eugene	Male	44	Colombia
Jade	Female	36	Thailand
Jian	Male	34	China
Naadir	Male	39	Iran

### 2.3 Data Collection

Following Institutional Review Board approval, all participants were provided with a consent form detailing the purpose of the study, survey and interview procedures, and safeguards in place to protect their privacy and confidentiality. Before the interviews commenced, participants completed an online, open-ended survey gathering demographic information. A semi-structured interview protocol was created to examine participants' academic and personal backgrounds, their postdoctoral appointment's positive and negative aspects, and their process in identifying career goals. Open-ended probing questions were included for the researchers to seek clarification and meaning during the interview. Interviews averaged 60 minutes in length. All participants were given pseudonyms, and only de-identified interview transcripts were stored.

### 2.4 Reflexivity and Positionality

Throughout the study, the research team engaged in individual and collective reflexivity by reflecting upon, bracketing out, and dialoguing about experiences and beliefs concerning the challenges faced by international postdoctoral scholars in the US. In qualitative research, reflexivity is a crucial component of inquiry, positioning researchers to consider their bias and its potential impact on meaning-making and interpretations during data analysis. Additionally, researchers must disclose their positionality so readers know the unique perspectives they bring to the study (Lincoln and Guba 1985). The research team comprised social science American women trained in qualitative research methods within educational settings. Two are professors, and the other is a doctoral student. All are engaged in STEM education research, particularly in efforts to diversify the engineering professoriate and broaden success in STEM academia. This work is seen as a matter of social justice; therefore, empathy and humility were integral to the data collection and analysis processes.

### 2.5 Data Analysis

Inductive thematic content analysis techniques (Silverman 2019) were employed to explore the challenges shared by international engineering postdoctoral scholars about working in the US. The transcripts were coded individually through three

review rounds, leading to 18 unique codes. Next, the researchers collectively cross-referenced the codes and identified five initial themes through consensus. Following consensus-building, the themes were refined for parsimony and to ensure the themes captured the entirety of the data and could be applied broadly. This refinement led to four final themes: (1) Immigration concerns; (2) Strains to find a community; (3) Pressure to publish and secure funding; and (4) Inadequate career counseling. This method allowed for flexibility and a successively deeper understanding of the challenges shared by the participants, which is valuable when approaching research patterns in inductive ways.

## **2.6 Trustworthiness**

Multiple verification strategies ensured the findings were trustworthy by attending to credibility, transferability, dependability, and confirmability (Lincoln and Guba 1985). Researchers utilized cross-case synthesis to address credibility, assessing whether themes were similar or different among the participants' perspectives. Thick, rich descriptions with participant quotes aided in the transferability of the findings. The researchers' reflexivity and statement of positionality bolstered the dependability of the findings by providing transparency about their backgrounds and experiences on this topic. Confirmability of the findings and conclusions was made possible by involving multiple researchers in using the inductive thematic content analysis approach and by providing several feedback loops to validate the themes.

## **2.7 Limitations**

As in all research inquiries, this study has several limitations. First, the researchers did not conduct member checks because arranging and conducting interviews was difficult due to participants' demanding schedules. Member checking might have provided more complex and nuanced depictions of their challenges. While the study attended to researcher bias through reflexivity and positionality, its potential to influence the findings and interpretations cannot be guaranteed. Last, this inquiry is primarily approached from an outsider's vantage point, as none hold an international or STEM academic background.

# **3 FINDINGS**

## **3.1 Immigration Concerns**

Nearly all participants indicated studying and/or working in the US was a lifelong goal. For instance, Naadir noted, "The best schools in environmental engineering are in the US based on global ranking of universities, so I knew I wanted to get my advanced training here." While none of the postdoctoral scholars shared difficulty in receiving their work visa, many noted visa restrictions and their plan to gain US residency status. Armando remarked, "Working here can be a little tricky for international people. I was working for a national lab, but I had some restrictions... I'm working on gaining residency, but if that doesn't happen, I'll have to go back home." Similarly, Eugene shared, "I need to change my residency status because I really want to spark the possibility of finding a permanent position in the US." US

politics around immigration policies was noted by Angela, who stated, “Being a postdoc who’s also international during the Trump administration...there’s just like a ton of stress that when you look at the news, and there’s an immigration headline, and then you have no idea if it applies to you or not.” As the participants were planning for their futures, navigating US immigration and residency policies was met with much trepidation as they shared concerns about the length of the process and the uncertainty of the results.

### **3.2 Strains to Find a Community**

Half of the participants discussed the difficulty in finding a community of postdoctoral scholars on their campus with whom to build friendships and support structures. Angela noted, “It’s just really hard to meet other postdocs, and I feel like there are things the institution could do to make that easier...I always say being a postdoc, it’s kind of isolating.” Abeo also discussed the isolation of the postdoctoral role, particularly in comparison to graduate school: “One of the main things that’s become really apparent is that it’s also a much more isolated experience than in grad school ...part of what I liked about grad school was...there were a lot of people and things were happening, I felt more connected on campus.” Jian shared how she sought out her own connections: “I found a support group organization and another within the College of Engineering...I wish there was an orientation connecting these things and making it easier to access some of the supports for postdocs.” This desire to find a community was palpable for those who were single, while individuals with families did not share this as a central challenge.

### **3.3 Pressure to Publish and Secure Funding**

All participants intimated being under tremendous pressure to publish and secure funding during their postdoctoral appointment. They indicated this pressure came from their postdoctoral advisors. However, they also understood these activities were important to master if they intended to move into a faculty role, particularly in the US. Angela commented, “This pressure to work all the time...there’s so much pressure to publish and to raise funds.” Moreover, while the pressure was high, many shared they had not received the direct instruction they hoped for. Abeo noted, “I’d sort of written scholarship and fellowship applications, but in writing bigger grants, I felt like I wasn’t particularly prepared for that after grad school. I was hoping that the postdoc would help with that.” Likewise, Jian shared, “It would be nice to know about professional events. I would like more support and training on how to get funding...I need more support in grant writing and grant applications in my postdoc.” Interestingly, Jade was the only one to mention the importance of finding a balance amid all the pressure: “It’s necessary to find a balance because you don’t want to kill yourself, or lose your life, to be really productive in writing.”

### **3.4 Inadequate Career Counseling**

All participants shared that little to no career counseling occurred with their postdoctoral advisors, but some indicated they had participated in institutional-sponsored career development activities. Jade said, “There’s this type of confusion

that I have these days on what I'm going to do next. I want to go into the professorship at a good university, should I do that here or go back to my home country? I need some more direction, but I'm not sure where I should get that from." Those focused on securing a faculty position mainly worried about their lack of teaching experience, as most had no teaching component connected to their postdoctoral work. Naadir stated, "I haven't had the chance to be a teaching assistant because here the teaching load is really light, and we don't have an undergrad program here." Others were interested in exploring research and industry positions but were unsure about how to find assistance in that area. Camila noted, "I wonder about a research position...I don't know much about them...I definitely need to think more about my next career step...I haven't had too many conversations about that." Abeo also expressed concern about inadequate career counseling: "If there were more resources for postdocs, especially more active career planning, that would be helpful...there might be jobs and situations that I don't necessarily know exist or have as much clarity of what it is they do." Clearly, additional support structures in this vein are warranted.

## **4 DISCUSSION AND CONCLUSION**

### **4.1 Discussion**

The purpose of this intrinsic case study was to explore the challenges faced by international engineering postdoctoral scholars working in the US. The inductive data analysis revealed four main themes: immigration concerns, strains to find a community, pressure to publish and secure funding, and inadequate career counseling. These findings confirmed and expanded upon the sparse literature on this topic. Notably, nearly all participants shared concerns about their immigration status and the hurdles they would need to overcome in order to stay in the US permanently. The strain in finding a postdoctoral community also is mirrored in the literature. All intimated intense "pressure to produce" publications and grant awards, coupled with a desire for greater support in these areas, as found by other researchers. Moreover, inadequate career counseling was discussed by all participants and was particularly acute for those who were deviating from initial plans to enter the tenure-track faculty job market, a topic all too familiar in the literature.

### **4.2 Implications**

Implications abound for Ph.D. advisors outside the US whose students may pursue postdoctoral positions in the US, as well as Ph.D. recipients themselves. Awareness of common challenges faced by international postdoctoral scholars can aid in being prepared early. For instance, international postdoctoral scholars may want to pursue and advocate for an H1-B visa since it involves fewer restrictions than a J1 visa. Seeking a community of postdoctoral peers and fellow nationals before arriving in the US may prevent feelings of isolation. Also, the writing demands and inadequate career counseling may be alleviated through accessing professional development opportunities offered at the postdoctoral institution and by organizations such as the NPA. Likewise, US postdoctoral advisors and US institutional international offices



must respond to these challenges in a systemic manner. Requiring postdoctoral advisor training and instituting individualized development plans that speak to personal and professional goals may ease the challenges identified. More work is needed at the institutional level to ensure international postdoctoral scholars thrive and are well-positioned to move forward successfully into academia or industry in their home country, the US, or beyond.

### **4.3 Future Research**

Future exploration is warranted to understand whether these challenges are unique to engineering postdoctoral scholars or indicative of larger postdoctoral training trends that must be dismantled. In order to do so, additional interviews and a survey could be administered to broaden and strengthen the findings and implications of this study. Also, while challenges with microaggressions did not rise to the level of a main theme, one postdoctoral scholar of Nigerian descent shared two related experiences. One interaction was with lab mates where it was suggested that it was easier for Black students to earn scholarships and fellowships in the US suggesting their skin color rather than merit dictated these accolades. Another was a one-on-one conversation in which he was told the academic bar was lower for women in the US. In both instances, the postdoctoral scholar was stunned and unable to respond, as he had little experience with racially- and gender-charged exchanges in his home country. Future research into this area could be informative and shed light on the comparable and divergent experiences of US Black, Latinx, Indigenous, Asian, Pacific Islander, and White women who also are subjected to these types of microaggressions.

### **4.4 Conclusion**

This intrinsic case study provides a deeper understanding of the challenges faced by international engineering postdoctoral scholars and ways to ease their challenges and aid in their career success. The findings indicate four major challenges: immigration concerns, strains to find a community, pressure to publish and secure funding, and inadequate career counseling. Raising consciousness on these challenges and ways to ease them is critical to postdoctoral success and the growing international postdoctoral US labor force.

## **5 ACKNOWLEDGMENTS**

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