Applying Theory-Based Analyses to the Entry and Persistence of Native American Engineering Faculty

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Introduction

Native Americans (NA) account for only 0.2% (N=68) of engineering faculty, while NA students are underrepresented in both undergraduate (0.6%; N=1853) and graduate (0.1%; N=173) engineering programs. Advising and mentorship from faculty members who identify as NA are important components to support programs for NA students in STEM fields. However, little is known about the experiences and career decisions of NA engineering faculty. Our exploratory study aims to identify the contextual and individual factors and the linkages in this small population that influence their entry and persistence as engineering faculty. Data is from four initial faculty interviews.

Methods

Interviews were conducted with NA engineering faculty members (n=4), identified through national association membership and snowball sampling. Three participants identified as men and one identified as a woman, aged 43- 64 (M=50.25). Interview questions began by inquiring about initial and general interest in the engineering field, followed by questions about entrance and persistence to faculty. The interviews and coding were completed by a multi-disciplinary team (including NA perspectives) with research backgrounds in career, engineering/STEM education, and NA's. After completing line-by-line coding, we revisited the transcripts and consciously recoded using two theoretical lenses: Social Cognitive Career Theory [SCCT] and Bronfenbrenner's Ecological Systems Theory [EST].

Theoretical Lens

Social Cognitive Career Theory [SCCT] identifies motivational variables that influence career goals and discusses the relationship between learning experiences, self-efficacy, outcome expectations, and socio-cognitive factors, positing that a feedback loop exists between the variables. SCCT recognizes the impact of individual and contextual influences on career development and attainment.

Bronfenbrenner's Ecological Systems Theory [EST]. We utilized this multi-systems perspective to explore career development. EST suggests that environmental aspects of people's lives are comprised of five systems: a) the Microsystem, the immediate environment, b) the Mesosystem, interactions between microsystems; c) the Exosystem, systems that influence individuals indirectly; d) the Macrosystem, cultural and societal patterns and values; and e) the Chronosystem, consisting of time and historic influences.

Results and Conclusions

Coding and interpretation focused on themes that emerged as to why the participants became and remained faculty members. Self-efficacy and outcome expectations from early experiences seemed to relate to the participants' entry into faculty positions, as did the impact of the mesosystem. Values instilled via the macrosystem appeared to sustain interest in faculty positions over time as did the influence of evolving microsystems. Complex and ever-changing learning experiences (e.g., research and/or teaching) appeared to maintain faculty role interest, as did the ability to foster self-efficacy and interest in students. Interestingly, participants voiced hesitance to directly encourage students to enter the faculty, preferring to provide learning experiences that increased student self-efficacy and attended to systemic (e.g., financial) demands of the students.

This analysis confirms that research in career development of NA faculty look longitudinally and examine the social and contextual factors that influence career choices at particular points in time. While the two theories provide some explanatory power, the results are not generalizable. Contextual models are imperative for meaningful gains in understanding NA participation in engineering field. The complexity of NA identify, geographic and tribal differences, and the historical context underlying NA participation in higher education are prominent contextual factors worthy of further investigation.

Social Cognitive Career Theory

Self-Efficacy

- Self-efficacy and accompanying outcome expectations developed due to early success in science and math
- Self-efficacy in becoming a faculty based on successful experience in presenting and conducting research
- Sustained interest in teaching through student outcomes and accompanying self-efficacy and satisfaction in faculty role

Learning Experiences

- Faculty positions provide the opportunity for a range of learning experiences
- Fast-paced, ever changing research and teaching atmosphere allowed for continued passion for the engineering field

Ecological Systems Theory

Microsystem

- Immediate family or mentors influenced decision to apply for job in specific geographical location

Mesosystem

- Opportunities for application and desire to work at particular university

Exosystem

- Engagement with professional and academic groups sustained interest

Microsystem

- Opportunities to provide mentorship of Native American students

Reflective Career Trajectory

Entry into Professorship

"I was helping people solve plumbing problems when I was a kid, and just naturally had a sort of a knack for assembling things"

"… thought I would stay at the national lab level … but I was married…wife wanted to move back to [home) to be closer to family… so I thought, what can I do with a materials science degree [there]?"

"… [giving a presentation] for very first time…was extremely nervous. When I was finished I had done this enough times that I felt very confident in front of a crowd of technical people"

"…raising a family like anybody else…want… good lifestyle…So, the money part makes it a little tougher to stay (as faculty) but you then look at the benefits."

Persistence as Faculty

"…always something different…problems… things to improve… always trying to tackle new problems or come up with new models and things… that's exciting"

"When teaching gets frustrating, you're hoping you've got some success in research so you can feel good about yourself for contributing generally to society for your scientific endeavors."

NATIVE AMERICANS ENGINEERING ASPIRATIONS

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