WIP: Exploring An Effective Mentorship Structure for Student Success in Higher Education

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Introduction

Mentoring practices play an essential role in students' academic success and retention, especially for women [1-5]. A positive and significant relationship was determined between mentees' academic self-efficacy and academic performance, as well as their self-regulated learning [6-8]. Concurrently, a sense of connectedness or belonging to a campus community is also a critical factor in academic achievement and retention [9, 10]. The mentor's self-efficacy can significantly impact the success of the mentoring relationship and the mentee's self-perception. Alternatively, ineffective mentoring can occur due to a lack of training, culturally responsive practices, identity interference, or mixed-match pairing, all of which can lead to negative psychosocial consequences [11-14].

The correlation between mentorship outcomes and persistence in engineering is poorly understood. Recommendations in a report from National Academy of Sciences, Engineering, and Medicine (NASEM), The Science of Effective Mentorship in STEMM (Science, Technology, Engineering, Mathematics, and Medicine), include, "Scholars should make greater use of study designs that allow for causal and longitudinal inferences, paying particular attention to the antecedents, processes, correlates, and outcomes within effective mentoring relationships in STEMM to determine the effects of mentorship on persistence and success in STEMM as well as on the STEMM enterprise." [15]. Thus, this work-in-progress research study evaluates the impact of mentorship structures on the sense of belonging and self-efficacy of First-Time-in-College (FTIC) women students over their first two years in college.

Research Scope and Method

The impact of a triad mentorship model for USF's FTIC women and their attrition rate in the College of Engineering will be assessed using a comparison group of about 24 FTIC women without mentors. The matched FTIC mentees are paired with three mentors: a peer, a faculty member, and an industry professional. Formal programming is required at various points over two years. At the start, mentors share their backgrounds and reasons for choosing their fields, while mentees outline their academic goals and career aspirations. Training modules are being developed for mentors through LinkedIn Learning and other resources.

Each mentor plays a unique role for the mentee. The peer mentors are available on a weekly basis, providing academic tutoring and campus support. Mentees meet with their faculty mentors at least once a semester to share their academic goals and inquire about academic strategies from an educator's perspective. The industry mentors must have at least one virtual or physical meeting with their mentees per year. Their role includes mentoring on career readiness, professional development skills, and internship opportunities. Throughout the study, the mentees have the autonomy to interact with their three-tier mentors outside of the formal programming requirements.

To determine the effects of similar social and cultural perspectives of mentor and mentee relationships on the sense of belonging from their first year and beyond, about half the number of

mentees are matched with mentors with similar or different sociocultural identities. Mentees are required to journal their experiences and complete reflection prompts annually.

Study Recruitment

All research participant participation is voluntary based on the University of South Florida's (USF) Institutional Review Board (IRB) regulations. Participants can opt out at will without any penalty. All FTIC women in the College of Engineering were notified through email invitation to over 200 students, and about 15% of the student population responded with interest. With this turnout rate, the study target was reached. Any students under the age of 18 were turned away. The number of participants and the mentoring structure are displayed in Figure 1. Similarly, peer mentors who are third-year students with a G.P.A. greater than or equal to 3.5 were emailed, and the total number of mentors needed was reached. Faculty members were recruited through word of mouth and email solicitations. Eight faculty members responded, but only six completed the required informed consent form in time to initiate the study. Industry mentors were recruited through a LinkedIn post and private messaging with contacts. Nine interested industry mentors with various backgrounds were recruited (Table 1). Peer and faculty mentors are compensated for their service through monetary support and gift items for the industry participants.

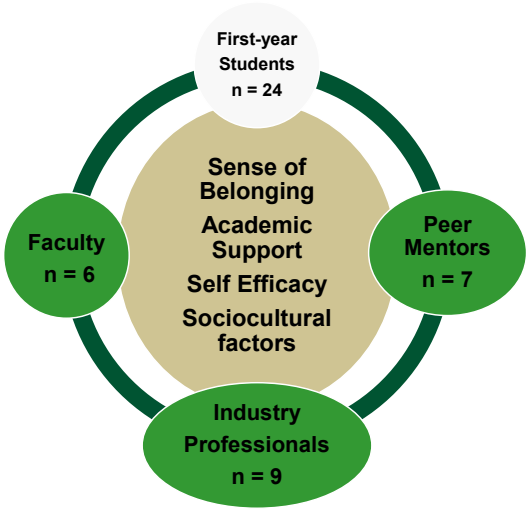

Figure 1: Structure of Mentoring Relationships and the Number of Participants.

Table 1: The Number of Study Participants Per STEM Discipline

Study Members	BME	ChE	Civil	CS (CE)	CyS	EE	EnvE	MechE	IT
Mentees	3	3	2	6 (2)	0	2	1	4	1
Peer Mentor	3	1	0	0	1	1	0	1	0
Faculty	1	1	1	2	0	0	0	1	0
Industry	2	3	1	1	1	0	0	1	0

Columns definitions: BME = Biomedical Engineering; ChE = Chemical Engineering; CyS = Cybersecurity; CS = Computer Science; CSE = Computer Engineering; EE = Electrical Engineering; EnvE = Environmental Engineering; Mech E = Mechanical Engineering; IT = Information Technology.

Survey Instruments

This work-in-progress research study is in the first-year phase. Participants are recruited and required to complete an inclusive demographics questionnaire before the mentor/mentee match [6]. Sample questions of the demographics survey include: *Which of the following best describes you? Sex/Gender, Age, Race/Ethnicity, G.P.A, Education level, Sexual Orientation. Select all that apply.* At the end of the study in year 1, all participants will be asked to complete a Cultural

Diversity Awareness Scale, while the mentors will complete the Mentoring Reflection Instrument (MERIT) [7, 8]. At the end of both years 1 and 2, all the matched mentees and the comparison unmatched FTIC group not enrolled in the triad mentorship study will complete Tinto's Sense of Belonging Scale (SOBs) framework, and Bandra's General Academic Self-Efficacy (GASE) Scale [16, 17]. Sample questions for the SOBs include "*I have met with classmates outside of class to study for an exam"*, and for the GASE, *"I know I can pass the exam if I put in enough work during the semester."*

Results & Discussion

Recruiting research participants was initially challenging, as most students ignore emails from unknown senders. Repeated notifications were sent through various mailing lists. One-on-one informed consent meetings educated participants about the study and their voluntary involvement, increasing enrollment as students shared benefits with peers. Recruiting peer mentors was also difficult due to the G.P.A. requirement, limiting participation across Industrial, Civil, and Environmental engineering. Faculty enrollment was slow because of the typical women's service commitments in academia; however, some learned about the study through colleagues. Three faculty members are non-tenure track, two are tenure track, and one is tenured. Industry mentors saw the recruitment flyer on LinkedIn and signed up, thereby limiting the range of STEM disciplines represented among mentors. Of the nine professionals, three are from Chemical engineering, two from Biomedical, and one from Civil, Mechanical, Computer Science, and Cybersecurity. A summary of the participants' STEM disciplines is in Table 1.

Each faculty and peer mentor is paired with up to four mentees, while industry mentors are paired with up to three mentees. Mentees document their experiences without knowledge of social and cultural differences to avoid bias. Monthly meetings with peer mentors provide feedback on mentees' academic progress and sense of belonging. In these meetings, peer mentors share feedback from their mentoring relationships, as each mentee has unique needs and personalities. Since the kickoff event, interest in joining the study has increased among prospective mentees and mentors. However, additional participants are being turned away as the mentoring relationship has begun. One peer mentor suggested creating a campus organization for informal mentoring for those unable to join the study.

A community is being built among the mentees. Peer mentors have created a final exam study preparation activity, providing resources and guides for first-year students in physics, chemistry, and calculus. They divide the coursework, with each mentor tutoring a specific course. No results have been gathered regarding the impact of this initiative. Ultimately, the research should clarify the influence of mentorship on engineering persistence for women students.

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