

Special Session: Pathways into Engineering Education Research

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Abstract— Our project explores a holistic approach to understand the identity transformation of traditional engineering faculty to engage with engineering education research. This work is part of a larger project that seeks to understand best practices of mentor-mentee relationships between engineering education researchers and engineering faculty entering the EER field. The overall project is a mixed methods study with Cognitive Apprentice Model (CAM) as the guiding framework [1]. In an effort to increase the community of engineering education researchers conducting engineering education research and to support research in the professional formation of engineers (PFE), the NSF has awarded Research Initiation in Engineering Formation (RIEF) grants to engineering faculty with little or no experience conducting social science research. The RIEF grants support a two-year collaborative research project where the engineering faculty member is mentored by one or more engineering education researchers. Since 2016, the PFE: RIEF program has supported over 35 projects across over 40 institutions. Engineering faculty are the primary educators of future engineers but are often not trained in engineering education research or approaches to implement research based instructional strategies (RBIS) despite the potential benefit to student development and outcomes. Therefore it is important to understand how engineering faculty are trained in engineering education research by engineering education researchers to promote synergistic activities between these two communities. Engineering faculty may not identify as engineering education researchers and failure in implementation or achieving less than the desired student outcomes can also hinder faculty motivation to adopt instructional innovation [2]. Overcoming these barriers and successfully training engineering faculty as engineering education researchers will expand and diversify engineering education research community. As more engineering faculty join the engineering education community they will bring new perspectives and ideas, and will promote collaboration between engineering education researchers and engineering practitioners. This community will facilitate interactions across teams to share experiences, resources, and expand networks. The goal is to build a community with multi-modal communication (i.e., in person meetings, online communication, etc.) to nucleate engineering faculty mentees and engineering education research mentors to create a community supporting the NSF PFE: RIEF program.

Keywords—Engineering Education Research (EER), Mentoring

I. PURPOSE

The purpose of the session is to elicit community feedback on what support is needed for engineering faculty interested in conducting engineering education research (EER). Upon completion of the workshop, attendees will be able to: (a) define and describe the current state of the EER community; (b) define and identify interactions needed for successful mentor/mentee relationships; and (c) define and identify barriers to successful mentor/mentee relationships that prevent engineering faculty from becoming engaged members of the EER community

II. JUSTIFICATION

Engineering faculty bring an important perspective to engineering education research (EER), yet they rarely receive formal training or mentorship in EER or approaches to implement research based instructional strategies (RBIS). STEM faculty exploring teaching innovation has been linked to improved student development and outcomes. Therefore, it is important to understand how engineering faculty implement EER paradigms and practices to improve teaching and learning in engineering. The practice of conducting EER by engineering faculty trained in traditional disciplines requires the acquisition of skills and knowledge, engagement in the community, and the ability to overcome barriers. Some barriers include knowledge gaps in the scholarship of teaching and learning, paradigm shifts in learning EER methods, imposter syndrome or limited access to engineering education researchers [3]. Restricted or inadequate interactions with experienced engineering education researchers can lead to less than the desired teaching and student outcomes. Overcoming these barriers and successfully training engineering faculty as engineering education researchers through direct mentorship will expand and diversify engineering education research community. Specifically, this session explores effective mentoring approaches that support the transition of engineering faculty into engineering education researchers by studying the direct mentor-mentee dynamics.

Since 2016, the NSF has invested approximately \$6.9 million in the PFE: RIEF program. The PFE: RIEF program was established to increase the community of engineering researchers conducting EER and support research in the professional formation of engineers (PFE). In the program, engineering faculty with little or no experience conducting social science research are mentored by an engineering

education researcher; the mentor and mentee work collaboratively on a two-year project. Despite the ongoing investment, there is a dearth of research to evaluate how the mentorship of engineering faculty by engineering education researchers is successful. Recent research suggest that the concept of mentoring has evolved and reflects the role of diversity and inclusion in engineering [4]. The proposed session will identify characteristics of successful mentoring practices and explore how to build productive relationships between engineering faculty in traditional disciplines and engineering education researchers.

III. INTERACTION

The session consist of an open dialogue with community members about the pathways to bring engineering faculty into the EER community. The session will be a guided discussion where participants will complete a GROW activity from both the mentee and mentor perspective.

<https://www.performanceconsultants.com/grow-model>

IV. SESSION DESCRIPTION

The workshop is part of a larger study to understand how to build successful mentoring relationships to broaden the engineering education research community. This workshop will begin by providing an overview of the history and current state of the engineering education community. Specifically, we will summarize current pathways into the EER community including the growing PhD programs around the country, the NSF RIEF and Building Capacity in STEM programs, and informal relationships or interdisciplinary collaborations. Next, the participants will engage in a guided discussion using a conceptual model to capture the current community members' perspective about the role of mentoring in creating pathways into the EER community. The session will conclude with a debriefing process to ensure accurate capturing of feedback, a brief overview of next steps of the project, and a few synthesizing comments.

V. AGENDA

This will be an 80-minute interactive workshop organized as follows:

- Introductions and overview (5 minutes)
- Current EER community (15 minutes)
- Community perspective on incoming EER mentees: GROW exercise (25 minutes)
- Community perspective on incoming EER mentors: GROW exercise (25 minutes)
- Summary and Wrap-up (10 minutes)

VI. ANTICIPATED AUDIENCE

This session is intended for engineering or engineering education faculty, researchers, and/or graduate students who

are interested in contributing to and participating in process to identify and create pathways into the engineering education research community.

VII. EXPECTED OUTCOMES

Identifying and supporting new members joining the EER community is important for promoting our community standards of quality and inclusivity within our growing field. We believe this session, from the inaugural networking event held in October 2019 and feedback from program participants on resources that would benefit the community, will be catalyzing for our community. Ultimately, the project seeks to develop a framework for an effective community for engineering faculty to develop in engineering education research training that will expand beyond the NSF PFE: RIEF program and continue to grow and diversify the engineering education community and bridge the gap between research and practice.

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