



Community Building for the NSF PFE: RIEF Program: Year 1

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Joseph Mirabelli is an Educational Psychology graduate student at the University of Illinois at Urbana-Champaign with a focus in Engineering Education. His work focuses on mentorship, mental health, and retention in STEM students and faculty. He was awarded the NAGAP Graduate Education Research Grant award to study engineering faculty perceptions of graduate student well-being and attrition. Before studying education at UIUC, Joseph earned an MS degree in Physics from Indiana University in Bloomington and a BS in Engineering Physics at UIUC.

Dr. Kelly J Cross, University of Nevada, Reno

Dr. Cross is currently an Assistant Professor in the Chemical and Materials Engineering Department at the University Nevada Reno. After completing her PhD in Engineering Education at Virginia Tech in 2015, Dr. Cross worked as a post-doctoral researcher with the Illinois Foundry for Innovation in Engineering Education and in the Department of Bioengineering with the Revolutionizing Engineering Departments (RED) grant at the University of Illinois at Urbana-Champaign. Dr. Cross' scholarship investigated student teams in engineering, faculty communities of practice, and the intersectionality of multiple identity dimensions. Her research interests include diversity and inclusion in STEM, intersectionality, teamwork and communication skills, assessment, and identity construction. Her teaching philosophy focuses on student centered approaches such as culturally relevant pedagogy. Dr. Cross' complimentary professional activities promote inclusive excellence through collaboration.

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Ally Barlow graduated with her Doctoral Degree in Civil Engineering from Oregon State University, where she fused her technical background with her passion for education; her doctoral research focused on the exploration of student engagement from multiple methodological standpoints. Now she works as a Postdoctoral Scholar at University of Nevada Reno, expanding her knowledge of the field through work on faculty-faculty mentorship modes. Her research interests include student cognitive engagement and teacher best practices for in-class and out-of-class learning.

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Introduction

In an effort to increase the community of engineering education researchers conducting engineering education research (EER) 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 an engineering faculty member is mentored by one or more engineering education researchers. Since 2016, the PFE: RIEF program has supported more than 40 projects across over 45 institutions. The present work describes preliminary efforts to build a community for new engineering educators and their mentors in the NSF PFE: RIEF program. This community will facilitate interactions across teams to share experiences and resources, and to expand professional 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 researchers to support the success of the NSF PFE: RIEF program. The community events will allow mentees to expand their professional networks in the engineering education research community by engaging with other mentors and mentees; a potential benefit of this expanded and deepened network is the promotion of future collaboration on engineering education projects that span institutions.

Project Overview

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. Ultimately, the project seeks to develop a framework for building a dynamic community for engineering faculty to develop in EER that will expand beyond the NSF PFE: RIEF program. The overall project is a mixed methods study with Cognitive Apprenticeship Model (CAM) [1] as the guiding framework. The research component of the project seeks to understand best practices of mentorship of engineering faculty in the RIEF program. Findings from the study will inform the research team's development of a community where common obstacles can be openly discussed and overcome, and successful outcomes and strategies shared. Towards this goal, a total of 18 RIEF mentors and mentees were interviewed about their experiences in the RIEF program and perceptions of EER as a field. Through this research and the development of a community for the RIEF program we aim to support the continued growth and diversification of the engineering education community and bridge the gap between research and practice. The current work describes an effort to assess the needs of both mentors and mentees in EER and preliminary work to build community for the NSF PFE: RIEF program.

Method

Institutional Review Board approval was obtained for the study. In the fall of 2019, a brief survey was distributed to current and past RIEF grant awardees (PIs and co-PIs that were identified from the NSF award database). In addition to providing background information about their project (role, current or completed project), participants were asked to reflect on the following questions:

- What support from the RIEF community would benefit you and your work?

- What resources would benefit you as a mentor to new engineering education researchers or as a mentee who is new to engineering education research?
- Do you have any suggestions for developing resources or hosting events for the NSF RIEF community?

Participant responses were analyzed by thematic analysis.

Results

In total, 29 participants responded to the survey. Of the survey responses, 8 were collected from self-identified mentors and 18 from self-identified mentees (3 participants did not specify their role on the project). The majority of participants had active projects (93%). Survey responses were analyzed and categorized by the following themes.

Networking

The most common theme identified by both mentors and mentees was the benefit of networking in the community, both to learn from the community and to facilitate collaborations. Both mentors and mentees commented on the benefit of the community in sharing experiences. One mentee noted, *“Honestly, just an ability to talk to others from an engineering education program about issues related to tenure and practices at their home institution. Being able to ‘compare notes’ and experiences is really informative.”* Another mentee wrote, *“The primary resource is to just hear about what others are doing and how they are doing it. This will help give me new ideas for research as well as thoughts on how that research can be conducted.”* Mentors expressed the benefit of sharing mentorship experiences and best practices. Mentees’ responses focused more on the benefit of networking in the community to expand their networks, to learn about the field from other researchers, and to find potential collaborators.

Resources and training

Both mentors and mentees described resources and training as potentially beneficial to the community. Mentors expressed the need for resources on effective mentoring practices, particularly focused on training engineering faculty in EER. Mentors also noted that case studies of new researchers would be of interest in guiding their current mentorship practices. Mentees indicated that resources (i.e. curated texts, articles, etc.) and training on specific topics in EER would be beneficial to their development while participating in the program. Topics listed included qualitative research methods, survey design, and publishing in EER journals. Several mentees also noted the need for training to prepare them to engage in EER beyond the RIEF project. For example, one participant stated, *“It would also be helpful to learn how investigators have used their successes from RIEF projects to move their research forward.”*

Other topics listed as potentially beneficial by participants included meetings with NSF program directors, a website, and methods of communication (i.e. Slack).

Community Building

One of the dominant topics from the community survey was a desire to facilitate networking and collaboration for the community. Towards this goal, a social networking event was held for current and past RIEF program participants in conjunction with the NSF EEC Grantees Meeting in October 2019. A total of 23 participants attended the networking event, the majority of which were mentees on recently funded projects. Overall the feedback on the event was positive, with

the majority of participants appreciating the opportunity to network with other RIEF awardees and learn about other RIEF projects. There was interest in future events for the community with a location and format more conducive to networking.

Discussion

The NSF PFE: RIEF program provides opportunities for engineering faculty to pursue an EER project under the mentorship of an engineering education researcher. The preliminary results suggest that the CAM approach is an effective method to integrate engineering faculty in traditional engineering disciplines into the EER community. Both mentor and mentee participants in our study of RIEF grantees suggested that one advantage which eased the training of RIEF mentees was their existing expertise in other research domains, easing the practitioner-to-expert transition defined by CAM theories [1]. Further, CAM may be a beneficial lens to study both formal and informal pathways into the EER community. The practice of engineering faculty conducting EER requires acquisition of skills and knowledge, engagement in the community, and overcoming barriers. Some barriers include conceptual difficulties in learning engineering education research methods [2], that engineering faculty may not identify as engineering education researchers or face imposter syndrome, and/or have a simplified mental model of EER and its practices. Further, failure in implementation or achieving less than the desired outcomes can also hinder faculty motivation to adopt instructional innovation [3]. Social support structures, including the mentor and other mentees in the community, may be key to overcoming several of these barriers faced by engineering faculty. In our preliminary survey of program participants, mentors and mentees emphasized the importance of networking within the community of RIEF awardees as being beneficial to themselves and their work. Efforts to build a community around the RIEF program will likely improve the experience for mentees and facilitate their integration into the community. Mentors will also benefit from the community structure by learning best practices from other mentors and lessening duplication of efforts. Further, additional resources for mentees to learn about the field of EER will promote their development as researchers. Resources on mentoring will benefit mentors to effectively mentor engineering faculty. Ultimately, the curation and creation of training in EER fundamentals will be beneficial to all engineering faculty by making the field of EER more accessible and will promote increased synergies between engineering and EER, which will increase the impact of the field.

Future Work

The current project highlighted the benefits in developing a community for the NSF RIEF program and outlined specific resources and events that are desired by the community. In our community survey, RIEF participants indicated the opportunity for networking with the community to support their work. Future work to provide supports for the RIEF community will include the development of training in EER, compilation of resources for engineering faculty new to conducting EER, and continued community events. Ultimately, the development of these resources will also benefit engineering faculty that are interested in EER but that are not currently participating in the RIEF program, which will further support the growth and diversification of the EER community.

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