Community Building for the NSF PFE: RIEF Program: Year 2

Dr. Karin Jensen, University of Illinois at Urbana - Champaign

Karin Jensen, Ph.D. is a Teaching Assistant Professor in bioengineering at the University of Illinois Urbana-Champaign. Her research interests include student mental health and wellness, engineering student career pathways, and engagement of engineering faculty in engineering education research. She was awarded a CAREER award from the National Science Foundation for her research on undergraduate mental health in engineering programs. Before joining UIUC she completed a post-doctoral fellowship at Sanofi Oncology in Cambridge, MA. She earned a bachelor's degree in biological engineering from Cornell University and a Ph.D. in biomedical engineering from the University of Virginia.

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.

Mr. Joseph Francis Mirabelli, University of Illinois at Urbana - Champaign

Joseph Mirabelli is an Educational Psychology graduate student at the University of Illinois at Urbana-Champaign with a focus in Engineering Education. His interests are centered around mentorship, mental health, and retention in STEM students and faculty. He was awarded the 2019 NAGAP Graduate Education Gold 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.

Ms. Mia Ko, University of Illinois at Urbana - Champaign

Mia is a 4th year undergraduate student studying Bioengineering with a minor in Material Science and Engineering at the University of Illinois at Urbana Champaign. On campus, she actively participates as an Engineering Ambassador: encouraging younger students' interest in STEM related fields while changing the definition and conversation of what it means to be an engineer. Her research interests include motivation and STEM curriculum development and evaluation. She is very excited to be a part of this community and hopes to spark the interest of engineering education research within her peer groups and to return to education after industry experience.

Dr. Jeanne L. Sanders, University of Nevada, Reno

Jeanne Sanders (she/her/hers) is a postdoctoral researcher in Engineering Education at the University of Nevada, Reno. She graduated with her Ph.D from North Carolina State University in the Fall of 2020. She plans to pursue a career in academia in the future supporting diversity, equity, and inclusion at all levels. Her research interests include raising awareness for and supporting students, faculty, and staff with gender-expansive, romantic, and sexual minority identities.

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Introduction

To support research in professional engineering formation and expand the community of researchers in engineering education, the NSF has supported teams of engineering faculty and engineering education mentors through the Research Initiation in Engineering Formation (RIEF) program. The RIEF program offers two years of funding for research projects conducted by engineering faculty new to the field of engineering education research (EER) who are trained in education methods by an experienced mentor. Since 2016, the RIEF program has supported more than 45 projects across over 45 institutions. The project seeks to understand best practices of mentor-mentee relationships between engineering education researchers and engineering faculty entering the engineering education research field. This exploratory, phenomenologically informed [1], qualitative study was guided by the Cognitive Apprentice Model (CAM) framework [2]. Participating in the RIEF program raised questions for the authors and identified additional opportunities to help integrate and support participants in EER. Our results suggest identifying a mentor as a critical challenge for both past program participants and those interested in applying to the program. This is a particularly untenable challenge for faculty who are located at institutions that do not have researchers with expertise in education research methods. Additional challenges cited to enter the engineering education field included adjusting to different methodologies and areas of literature, lack of student programs, working with mentors who are located at different institutions, balancing engineering education research with other faculty roles, and navigating power dynamics within mentorship structures. To address these needs, in this paper we describe our networking events for RIEF program participants and for potential program participants to connect with mentors in engineering education. Plans for the networking events will be shared along with feedback from past participants. Ultimately, the project seeks to develop a framework for an effective community for engineering faculty to develop and sustain engagement in engineering education research that will expand beyond the NSF RIEF program.

Project Overview

The project "Developing Engineering Faculty as Engineering Education Researchers Through Mentorship" explores the development of engineering faculty as engineering education researchers, leading to the development of training, networking, and community building for engineering faculty entering the field of engineering education. The project is guided by the CAM model as a theoretical framework and addresses the overall research question: How are engineering faculty participating in the NSF PFE: RIEF program trained and integrated into the engineering education community? In the first phase of the project, we interviewed 18 current and former PFE: RIEF participants (both mentees (PIs) and mentors (co-PIs)).

With the goal of supporting sustained engagement in engineering education research, our interview study and subsequent analysis focused on the motivation of RIEF mentees and the mentorship experiences of RIEF grantees [3]. RIEF projects typically include one mentor and one mentee, but some teams include multiple mentors or mentees. In general, mentees were motivated by a desire to improve their own training or to pursue projects which would improve the experience of students, and their experience was defined by learning engineering education research (EER) methods and literature while working closely with their mentoring team. A common theme expressed by mentees concerned the identification of strong mentors as a barrier to their EER training, and in general, mentees on teams with multiple mentors reported a better overall experience. RIEF mentees were often faculty at institutions without formal EER programs, lacking available mentors and thus paired with faculty at other institutions, leading to complicated schedules and a lack of consistent mentorship, in addition to other issues. RIEF mentees shared broad motivations to conduct EER but made the decision to do EER work at various stages of their career, whereas many practicing engineering education researchers are junior faculty. Resulting, some RIEF mentorship teams include mentees who have a higher academic rank than their mentors, leading to challenges due to power dynamics. Many EER researchers specialize in either quantitative or qualitative research methods, while new faculty may be curious about both – some mentees expressed that the mentor they paired with did not fully capture their interests, requiring a larger network they did not yet possess.

Based on these findings and the experiences of the authors, the authors strongly believe that scaffolding the network of prospective engineering education researchers and introducing these researchers to potential mentors is an area of need for the field, particularly for aspiring RIEF grantees. The project's first networking event was a social event intended to connect RIEF grantees at the 2019 NSF Grantee's October meeting [4]. RIEF awardees attending that event were surveyed about their experience with the event and the EER community. In open responses related to experience in that event, attendees consistently expressed that more networking opportunities within the EER community would benefit them. Additionally, our team presented workshops to the community twice in 2020, first at the ASEE virtual annual conference, and then at the FIE international conference [5]. Both workshop presentations consisted of a mixture of anecdotes, advice, and study findings contributing to participants' knowledge of transitions into engineering education, the RIEF grant process, and mentorship in engineering education. Group activities at the virtual workshops were focused on participants' reflecting about their own mentorship experiences and needs, their motivations for participation in EER, and ways they could actively enhance their involvement in the EER community.

Community Building in Year 2

Our team's Summer 2021 networking event was designed to reduce these barriers to entry into engineering education research by facilitating mentor-mentee introductions. Participants in the event are asked to create a short slide introducing themselves as either prospective mentors or mentees and to list their mentorship and research interests. Attendees will take part in a brief introductory presentation in which our team will conduct a large group activity about EER topics

and our mentorship findings, and then attendees will be given opportunities to meet during the event in breakout room discussions in either pairs or in small groups. The networking event seeks to match interested participants to facilitate future application to the NSF RIEF program or other similar opportunities, and will be held before the ASEE 2021 annual conference, with the goal of increasing participants' awareness of scholars with similar interest who they could then interact with during the virtual conference. Participants are asked to complete informational introduction mini-posters to be shared with the groups to promote establishing collaborations between researchers with shared interests and synergistic strengths. In 2022, our team will offer another instance of this networking opportunity, as well as small pilot grants to mentorship teams interested in applying for RIEF awards or otherwise introducing faculty to EER work. In addition to the networking event, through the project we have also developed a website with curated resources for researchers entering the field of EER.

The networking event was designed as an independent virtual event in order to maximize our team's control of a virtual platform (e.g. designing/assigning breakout rooms in advance), and control for unknowns surrounding the status of the COVID-19 pandemic and its effects on summer conferences by selecting a time and virtual format independent from known conference dates. Participants were surveyed about the effectiveness of the event, their professional and personal demographics, and their experiences with the event. Analysis of the survey data is forthcoming, and this will allow us to revise the event and support in 2022. This will also increase our understanding of who are attempting to be mentors or mentees in engineering education research projects.

Discussion

Our ongoing project to study the NSF RIEF program seeks to identify and meet needs of engineering faculty who are beginning research in engineering education research. While engineering faculty bring an important perspective to engineering education research, they are often not formerly trained in engineering education research methods and may face barriers to entering the field [6].

The overall goal of the networking and workshop events designed by our team is the foundational structures of the community of practice centered around the integration and support of new EER researchers. Towards that goal, particularly due to the lack of possible in-person events during the COVID-19 pandemic, we have created multiple online resources to support entrants into EER, including a website supporting mentorship in EER, a Slack workspace for EER mentorship, and a workshop series for the 2020 RIEF award cohort. Virtual workshops and informal online events with the engineering education community members can empower new community members towards practitioner-level skills and foster collaborations and connectedness within the community [7,8]. Our team continues to compile resources, create networking opportunities, and events within our virtual community.

By connecting NSF RIEF PIs, engineering faculty beginning in engineering education research will connect with other engineering faculty conducting engineering education research across the

country, which will grow their networks, provide support systems for success, and spark future collaborations. Further, community building of NSF RIEF co-PIs (EER mentors) will provide resources and support to mentors who often do not receive training in mentoring. Ultimately, our project seeks to build a community of practice to support engineering faculty entering the engineering education research community and support their sustained engagement in the field.

Acknowledgements

References

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