Learning the Ropes Together: A Collaborative Autoethnographic Study of an Unconventional RIEF Mentoring Model

Dr. Jennifer S. Brown, University of Georgia

Dr. Jennifer Brown earned her PhD in Engineering and Science Education (2023) and her M.S. in Mechanical Engineering (2020) from Clemson University. She is currently working as a postdoctoral scholar with the Elevate research team in the Engineering Education Transformations Institute at the University of Georgia. Her primary research foci include using asset-based frameworks in student and faculty development, graduate well-being, and mentorship of women and others with marginalized identities in STEM. Her engineering background is in advanced manufacturing and design.

Landon Todd Smith, University of Georgia
Mrs. Kristina Kennedy, The Ohio State University

Kristina Kennedy joined The Ohio State University in 2021 as an Associate Professor in the College of Engineering and Faculty Director for the Integrated Business & Engineering Program (IBE) – a multidisciplinary, cross-college program serving both business and engineering honors students. In this role, Kennedy teaches the IBE First-Year Cornerstone and IBE Senior Capstone courses. Additionally, she oversees the program – creating meaningful experiences for students, raising funds, and forging industry partnerships for student success.

Prior to her current role, Kennedy worked as an engineer with Honda Research & Development. Her roles included test engineer, interior quality lead and most recently, project leader for the Honda Odyssey and Acura MDX. During her time with Honda, she founded the first global Business Resource Group - the Women in Engineering Network – to support, develop, and highlight the work of its members. She participated in a number of leadership programs and is featured in the ”Who Makes a Honda” series.

Kristina holds a BS in Mechanical Engineering from The University of Iowa and an MBA from The Ohio State University. In her spare time, she enjoys spending time with her family (game nights, cheering for her kids’ sports teams, and puzzling), traveling, and volunteering.

Dr. Fred Richard Beyette Jr., University of Georgia

Fred R. Beyette Jr. has been teaching and performing research in areas related to Mixed Technology Embedded Systems since 1988. From 1988 to 1995, his efforts contributed to the work of materials, device and systems specialists at the NSF Engineering Res

Dr. Julie P Martin, University of Georgia

Julie P. Martin is the Director of the Engineering Education Transformations Institute at University of Georgia. Julie is a Fellow of ASEE, a member of ASEE’s Hall of Fame. She is the editor-in-chief of Journal of Women and Minorities in Science and Engineering, where her mission to change the culture of academic publishing to one of constructive review.

Learning the Ropes Together: A Collaborative Autoethnographic Study of an Unconventional RIEF Mentoring Model

Introduction

As an established engineering practitioner or engineering research scholar, one of the most challenging aspects of transitioning into a new field of research (engineering education research, or EER) is the paradigm shift that accompanies this transition while also feeling like a novice in a new field. The NSF Research Initiation in Engineering Formation (RIEF) program aims to expand the EER community and build knowledge around the professional formation of engineers. Since 2011, NSF has invested over $23 million in Research Initiation Grants in the Engineering Education program and its successor, the PFE: RIEF program; however, to date, few studies have been conducted on the nature and outcomes of RIEF mentoring relationships [1], [2], [3], [4].

In this collaborative autoethnographic study, we contribute to knowledge surrounding EER research capacity building by exploring a novel mentoring structure that involves two RIEF principal investigators (faculty mentees), their EER faculty mentor, a first-year EER graduate student, and a postdoctoral EER scholar. Uniquely, the graduate student and postdoctoral scholar occupy dual mentor-mentee positions, as they possess more qualitative educational research experience than the RIEF faculty mentees yet are still learners themselves under the guidance of the EER faculty mentor. This builds upon the EER faculty mentor's prior autoethnographic work with former RIEF mentees [2], [5] and is unique as each RIEF faculty mentee is leading their own separate RIEF project yet engaging in mentoring as a team.

Theoretical Framing

The relationships within this mentoring structure are primarily grounded in two mentoring models: Eby and colleagues' (2013) process-oriented mentoring model and Dennen & Burner's (2008) cognitive apprenticeship model.

Eby and colleagues' (2013) process-oriented model of mentoring, which includes: instrumental support behaviors relating to the mentee achieving a professional goal; psychosocial support (e.g., encouragement) of the mentee; and relationship quality. This model also takes into account interaction frequency, relationship length, and social capital (i.e., social influence based on one's social network) [6].

Dennen & Burner's (2008) cognitive apprenticeship model, which describes the process of learning through expert demonstration and guidance/coaching by experts in a topic. Cognitive apprentices begin through observation ("legitimate peripheral participation") before they are then situated in an "authentic task" with their participation intentionally "scaffolded" (guided) by an expert mentor and a community of practice (the PIs and co-PI) [7].

Methods

Our research team is using collaborative autoethnographic methods in this ongoing study to investigate how our diverse mentoring group interacts to learn qualitative research methods in the context of EER. Collaborative autoethnography is a qualitative research method that is "simultaneously collaborative, autobiographical, and ethnographic" [8, p. 17] in that it involves a group of people collectively reflecting and documenting their perceptions of a shared cultural or learning experience. It can be described as "a study of self [that is] conducted in the company of others" [8, p. 17]. In this work, we are a group of five academic researchers and practitioners at multiple career stages collectively reflecting on our perceptions of mentoring relationships within the context of the two RIEF projects that began in August 2024.

A collaborative approach allows the mentoring team to reflect on our evolving identities as EER scholars and mentors. Although the RIEF faculty mentees' research focuses on entirely different domains in the professional formation of engineers, there are shared commonalities in their qualitative methods and analysis techniques that provide a cohesive structure for cross-disciplinary learning and support. This mentoring model not only facilitates a deeper understanding of qualitative research methods and analyses (e.g., interviewing, thematic analysis, narrative analysis) for all involved, but also creates an opportunity for the EER graduate student and postdoctoral scholar to develop valuable mentoring skills while advancing their own research capabilities.

Logistically, our team meets weekly as a full group with all five members during the academic semesters, followed by two individual meetings focused on each faculty mentee's specific RIEF project. In the individual meetings, only one faculty mentee is present (four of the five mentoring team members are present). Throughout the year, each team member individually completes a monthly written response to structured reflection questions that were co-created by the team at the start of the fall 2024 semester (Table 1). Some questions offer sub-questions to help guide team members' reflections; however, team members were not required to address all sub-questions in each monthly reflection.

Table 1. Structured reflection questions.

Question	**Primary purpose(s)**
Overall, how do you think the project is going right now?	Elicit general reflection of individual RIEF project progress
What has been surprising since the last reflection?	Identify notable instances (e.g., "aha!" moments) or challenges between reflections
Tell me about your experience as a mentee/mentor since the last reflection. *Example sub-questions:* a) What's (not) working well in the mentoring relationship?	Elicit perceptions of the current mentoring dynamics within the team. Prompt reflection of their role within the overall mentoring team.

b) What can you do better as a mentee/mentor? c) What was not helpful or constructive?	Identify strengths and areas of improvement within the context of team interactions.
What has the mentee learned or accomplished since the last reflection? What helped them learn or accomplish this?	Document progress and personal/professional successes with respect to the project.
What are you learning about the mentoring relationship? How might you apply this to other mentoring relationships? *Example sub-questions:* a) What specific instrumental actions has the mentor taken recently? b) What specific expressive actions (e.g. encouragement) has the mentor taken recently? c) What was not helpful or constructive?	Reflect on knowledge gained from the mentoring process and its transferability to other contexts. Identify specific actions that had memorable impact on them as a mentee/mentor.

With each team member's permission, these monthly written reflections are then posted to a shared online folder so that the team can read them all and individually take time to process what the other members had reflected on. At the following week's group meeting, the RIEF faculty mentor leads a group discussion on the written reflections to identify ways in which the group can improve its cohesion and communication moving forward and discuss common themes. Previously, we co-created ground rules for the group discussions to foster psychological safety during these debriefs.

To complement the written reflections, each research team member is periodically interviewed by an external interviewer to reflect on their experiences. This was intentionally designed, as some team members are more comfortable sharing in depth verbally as opposed to the written responses. The external interviewer is trained in conducting qualitative interviews and probed each team member about 1) their paradigm shift from engineering research and practice to EER, 2) their perspectives on the mentoring team and its advantages/disadvantages, and 3) their goals for the mentoring relationship. These interviews were then professionally transcribed and verified for accuracy by the graduate student.

Periodically (every 9-12 months), the research team meets to analyze all of the collaborative autoethnographic data collected to date to identify 1) a timeline of key moments or turning points in the team's mentoring relationship with one another, 2) key strategies that strengthened the mentoring relationship, and 3) things that need to be addressed as a team to improve its cohesion and communication (i.e., areas of improvement).

Preliminary Findings

Through the group's monthly discussions about the written reflections, the team has preliminarily identified several strategies that have contributed to the early success of the mentoring team's relationships:

1) **Intentionally structure initial team meetings to introduce "onboarding" topics or tools that are relatively new to novices in EER or qualitative research.** Topics that

proved helpful to discuss as a team included institutional review board (IRB) requirements for human subjects research, quality frameworks for qualitative research (such as the Q3 framework [9], [10]), and a process-based tool to help researchers self-reflect on their interviewing skills and interview protocol [11].

2) **Co-create IRB applications, questionnaires, and interview protocol drafts as a group, while mentors articulate their rationale behind the edits that they suggest (making expert thought processes explicit [7]).** This helps expedite the submission and processing of the IRB, removing a significant barrier to progress; however, it still includes mentees as a legitimate peripheral participant in an authentic task [7]. In our work, we leveraged commonalities between the RIEF mentees' projects to streamline the IRB co-creation process. contributed to this IRB co-creation method as a way to streamline this aspect of the research.
3) **Recognize that it will take time for both new mentors and mentees to grow comfortable in the team mentoring dynamics and take leadership in mentoring.** This is especially true for those in the dual mentee/mentor roles that are vulnerable to a stranger power dynamic (graduate and postdoctoral researcher) as neither are faculty.
4) **Be transparent about pivots when unanticipated delays occur, so that the team can get back on track quickly.** Often, the delays were outside of the team member's control (e.g., overwhelm due to large teaching or administrative burdens, changes to institutional policies that affect aspects of the projects). Discussing them openly as a team helped reduce the associated stress or disappointment and allowed the team to crowd-source solutions amongst themselves.

Looking Forward

By studying this unconventional team mentoring model through collaborative autoethnography, these partner RIEF projects highlight how diverse perspectives and experience levels in a mentoring team can enrich research collaborations in EER. The findings have broader implications for engineering faculty development, mentoring strategies, and a greater awareness of qualitative methodologies in traditionally quantitative disciplinary engineering fields. At this moment, the research team is approaching its first periodic meeting (April 2025), wherein they will meet to analyze the collaborative autoethnographic data collected thus far. The outcomes of this analysis – including research team testimonials – will be shared during the NSF grantees poster session.

Acknowledgement of Support

This material is based upon work supported by the National Science Foundation under Award No. 2404731, 2404732, and 2405679.

References

[1] K. J. Jensen, I. M. Miller, D. E. Suresh, and J. P. Martin, “Beyond skills: building research capacity through cognitive apprenticeship and social capital,” *Australas. J. Eng. Educ.*, vol. 28, no. 1, pp. 97–109, Jan. 2023, doi: 10.1080/22054952.2023.2230068.

[2] J. Martin, D. Suresh, and P. Jensen, “Perceptions of shared experiences in mentoring relationships: a collaborative autoethnography,” in *2022 ASEE Annual Conference & Exposition Proceedings*, Minneapolis, MN: ASEE Conferences, Aug. 2022, p. 41058. doi: 10.18260/1-2--41058.

[3] J. Mirabelli, A. Barlow, M. Ko, K. Cross, and K. Jensen, “Work in Progress: A Qualitative Study of Mentorship, Training Needs, and Community for New Engineering Education Researchers,” in *2020 ASEE Virtual Annual Conference Content Access Proceedings*, Virtual On line: ASEE Conferences, Jun. 2020, p. 35601. doi: 10.18260/1-2--35601.

[4] J. F. Mirabelli, A. J. Barlow, J. L. Sanders, E. Ko, K. Jensen, and K. J. Cross, “Mid-career transitions into engineering education research via structured mentorship opportunities: Barriers and perceptions,” *Australas. J. Eng. Educ.*, vol. 28, no. 1, pp. 59–73, Jan. 2023, doi: 10.1080/22054952.2023.2217046.

[5] J. P. Martin, D. E. Suresh, and P. A. Jensen, “Using collaborative autoethnography to investigate mentoring relationships for novice engineering education researchers,” *Int. J. STEM Educ.*, vol. 11, no. 1, p. 13, Feb. 2024, doi: 10.1186/s40594-024-00473-8.

[6] L. T. D. T. Eby *et al.*, “An interdisciplinary meta-analysis of the potential antecedents, correlates, and consequences of protégé perceptions of mentoring.,” *Psychol. Bull.*, vol. 139, no. 2, pp. 441–476, Mar. 2013, doi: 10.1037/a0029279.

[7] V. P. Dennen and K. J. Burner, “The Cognitive Apprenticeship Model in Educational Practice,” in *Handbook of Research on Educational Communications and Technology*, 3rd ed., J. M. Spector, M. D. Merrill, J. van Merrienboer, and M. P. Driscoll, Eds., New York: Routledge, 2008, pp. 425–439.

[8] H. Chang, F. W. Ngunjiri, and K.-A. Hernandez, *Collaborative autoethnography*. in Developing qualitative inquiry, no. 8. Walnut Creek, Calif: Left Coast Press, 2013.

[9] J. Walther, N. W. Sochacka, and N. N. Kellam, “Quality in interpretive engineering education research: Reflections on an example study,” *J. Eng. Educ.*, vol. 102, no. 4, pp. 626–659, Oct. 2013, doi: 10.1002/jee.20029.

[10] J. Walther *et al.*, “Qualitative Research Quality: A Collaborative Inquiry Across Multiple Methodological Perspectives,” *J. Eng. Educ.*, vol. 106, no. 3, pp. 398–430, Jul. 2017, doi: 10.1002/jee.20170.

[11] A. Brooks and J. Huff, “Evaluating the quality of interviews with a process-based, self-reflective tool,” in *2023 ASEE Annual Conference & Exposition Proceedings*, Baltimore , Maryland: ASEE Conferences, Jun. 2023, p. 43453. doi: 10.18260/1-2--43453.