

## **BOARD # 335: CAREER: Basics Matter: The Role of Space and Documents in Supporting Critical Conversations and Inclusion on an NSF Funded Engineering Education Research Group**

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Courtney Faber, Ph.D., is an Assistant Professor of Engineering Education at the University at Buffalo (UB). Prior to joining UB in August of 2023, she was a Research Associate Professor and Senior Lecturer in Engineering Fundamentals at the University of Tennessee, Knoxville. She was also the Director of the Fundamentals of Engineering and Computing Teaching in Higher Education Certificate Program. Her research focuses on empowering engineering education scholars to be more effective at impacting transformational change in engineering and developing educational experiences that consider epistemic thinking. She develops and uses innovative research methods that allow for deep investigations of constructs such as epistemic thinking, identity, and agency. Dr. Faber has a B.S. in Bioengineering and a Ph.D. in Engineering and Science Education from Clemson University and a M.S. in Biomedical Engineering from Cornell University. Among other awards for her research, she was awarded a National Science Foundation CAREER Award in 2022 to study epistemic negotiations on interdisciplinary engineering education research teams.

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Lorna Treffert is a 1st year Ph.D. student in the Theory and Practice in Teacher Education Department at the University of Tennessee, Knoxville. She holds both a BS and MS in Industrial and Systems Engineering. Her research interests include facilitating diversity and inclusion within engineering education and applications of operations research in an education context.

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Dr. Danielle Vegas Lewis is currently the Postdoctoral Associate in Dr. Courtney Faber's ENLITE lab in the Department of Engineering Education at the University at Buffalo. Her research agenda aims to understand and disrupt the ways in which socially constructed identities allow for the reproduction of social inequality, with a focus on understanding the ways institutions of higher education and other social structures challenge or uphold hegemonic environments in which majority populations accumulate power that harms students underrepresented in certain contexts.

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Aaron is a third-year undergraduate student at the University at Buffalo working towards his Bachelor's of Science in Electrical Engineering. He has assisted in several qualitative research projects during his time at the university. Aaron also serves as a student ambassador of justice, equity, diversity, and inclusion for the School of Engineering and Applied Sciences.

# **CAREER: Basics Matter: The Role of Space and Documents in Supporting Critical Conversations and Inclusion on NSF Funded Engineering Education Research Groups**

## **Abstract**

Engineering education research groups strive to transform the field of engineering through the integration of research and practice. Many of these research groups are interdisciplinary, including individuals from different fields (e.g., engineering, engineering education, education, sociology) and different roles within an institution. These individuals bring their own approaches to the generation, expression, and application of knowledge. While these epistemic differences can support the use of novel, interdisciplinary approaches, they can also lead to tensions that prevent groups from meeting their core goals. The goal of this project is to explore how engineering education research groups navigate these epistemic differences and engage in critical conversations to make research decisions. In Phase A of our study, we used Longino's Critical Contextual Empiricism framework, which defines four norms of an idealized knowledge generating community to characterize the epistemic culture of the groups we studied. In this paper, we focus on how the norm of providing venues for critique and idea sharing supports critical conversations and inclusion among group members. We identified three affordances related to a group's use of shared agendas, a type of venue that facilitate discussion of multiple project efforts, facilitate participation, and support group memory. Our work shows the importance of considering the details of the venue used to hold group meetings and how aspects of these spaces can support critical interactions among group members.

## **Introduction**

Engineering education strives to transform the field of engineering by integrating research and practice. These efforts often involve groups of individuals from fields such as engineering, engineering education, sociology, and psychology and from different roles within a university (e.g., faculty, administration, student support staff) [1], [2], [3]. Each of these group members bring their own approaches to the generation, expression, and application of knowledge. These differences in thinking are key to the success of engineering education; however, they can create tensions that prevent many groups from achieving their core goals. These tensions are often associated with ineffective communication or project management, which overlook the more fundamental differences around what counts as knowledge and how knowledge is generated – epistemic differences [4], [5]. The goal of this project is to explore how research groups navigate these epistemic differences and engage in critical conversations to make research decisions. Our recent efforts have focused on characterizing the epistemic culture of engineering education research groups using Longino's Critical Contextual Empiricism framework [6].

## **Theoretical Framework**

We used Longino's Critical Contextual Empiricism (CCE) framework as a lens to characterize the general epistemic culture of the groups we studied [6]. According to Longino, knowledge is generated through critical interactions that occur across multiple points of view. The CCE framework defines four norms that foster critical interactions within a knowledge generating community (e.g., research group) [6]. In prior work, we operationalized and defined these norms within the context of engineering education research group meetings. These four norms are: 1) providing venues for critique and idea sharing, 2) uptaking critiques and ideas, 3) recognizing

public standards, and 4) maintaining tempered intellectual equality. For full definitions of each norm, see [7].

In this paper, we specifically focus on the findings related to the venues that research groups use and how these characteristics support critical conversations and inclusion among group members. Venues within group meetings are the places and time periods where ideas, methods, assumptions, and reasoning can be discussed, evaluated, and critiqued by the team. The place includes the location of the meeting (physical or virtual) and any shared documents the group engages with during the meeting.

### **Methods**

Our data included 13 recorded group meetings (approximately 15 hours of data) from groups who hold all their project meetings virtually and transcripts from interviews with 7 group members. We watched the recorded group meetings and identified critical interactions. These critical interactions included instances in which the group discussed research decisions and included discussions about project goals, data collection approaches, and dissemination efforts. For each critical interaction, we generated detailed fieldnotes and analyzed the data to understand the group's epistemic culture through coding and memo writing. We followed Charmaz's [8] approach to inductively code the data and worked collaboratively as a team to develop a codebook that was used to analyze the later critical interactions. As we defined our codes, we organized them under categories that aligned with the CCE norms [6].

From the coded data, we constructed Structured Analytic Memos (SAM) that provided an overview of the critical interaction, described how each norm showed up, identified key takeaways, and described what was important to the group's dialogue but was not reflected by the CCE norms.

After constructing a SAM for each critical interaction, we conducted a cross-memo analysis to understand the predominate ways the group engaged during meetings and how aspects of the CCE norms connected to one another. To support this analysis, we constructed an Excel table where we noted the instances where each code for the norms showed up. The rows were defined by the codes for each norm and the columns were defined by the instance. We also constructed an overall memo to describe the group's general epistemic culture based on the four CCE norms. This memo was collaboratively constructed by two members of my research team and checked by three other members, including myself. The findings below come from this cross-memo analysis.

### **Findings**

The two dimensions of venue - physical/virtual attributes of the venue (e.g., Zoom meeting space, shared collaborative meeting agenda, project management platform) and the acts committed by the group members which shape the nature or direction of the venue were leveraged regularly to make research decisions. Group members consistently took actions using physical attributes of venue (e.g., meeting agendas, grant-related documents, proposals, or concept papers) to direct and focus the group's conversations.

#### **Use of Shared Agendas can Facilitate Discussion of Multiple Project Efforts**

The group used a shared, running agenda document to structure their meetings. Each of the group members had access to this document and could contribute to it during and outside of their meeting time. This agenda listed their ongoing efforts, the status of these efforts, and any notes

from previous discussions. Before the group meeting or during the first few minutes of the meeting, the meeting facilitator would arrange the agenda items in order of urgency and assign a time limit to each item. After arranging the items, the facilitator would check-in with the group about the order of the topics and adjust based on feedback. Prioritizing agenda items and assigning time limits enabled the group to make space to discuss multiple project efforts. The individual group members were also mindful of when they were getting too far off track and made efforts to redirect the conversations back to the agenda item topics.

### **Use of Shared Agendas can Facilitate Participation**

The shared, running agenda facilitated group member participation and helped the group recall previous decisions and questions. We observed group members typing what was being said by someone else in the meeting agenda. This action showed recognition of the group member's contribution and served to ensure that the group correctly heard the idea. We also observed group members typing their own ideas in the document during a pause in the discussion. The shared agenda provided a way for group members to contribute to the conversation beyond speaking up during the meeting.

### **Use of Shared Agendas can Support Group Memory**

The group's documentation of project tasks and decisions within their shared agenda helped the group members recall previous discussions. This note taking and documentation was especially important because the group would often take multiple meetings to fully discuss an idea and make a decision. The group would use the meeting agenda to ensure that a topic would be addressed or a discussion would be revisited in the future. For example, if a group member attempted to shift the venue, but they were low on time, setting up a future venue by adding the question or idea to the agenda was a way to put a new topic on the backburner and make sure it wasn't forgotten. This approach was also used when a decision could not be made and group members felt they needed more time to reference literature or consider alternatives/brainstorm on their own. There were other times when a group member preferred not to have a discussion during a particular meeting because a group member who was integral to the discussion was not present. Setting up a future venue essentially ensured that a topic or discussion would be revisited in the future.

### **Implications**

Our work shows the importance of considering the details of the meeting space used to hold group meetings and how aspects of these spaces can support critical interactions among group members. The group we studied used a shared, running agenda in all their meetings. This shared agenda supported the discussion of multiple ideas, facilitated participation of group members, and supported group memory.

We encourage research groups in our community to consider the physical/virtual attributes of their meetings spaces and how these attributes might be supporting or restricting critical interactions. In our previous work, we shared how the use of a project management platform by another group we studied resulted in their conversations centering on the progress of tasks rather than how tasks were being done [8]. Given the diverse nature of Engineering Education research teams, effectively leveraging venue – places and time periods where discussions occur – can serve as a strategy to navigate challenges caused by differences in epistemic thinking. In proactively addressing issues related to teamwork, groups may welcome and enable critical

conversations, which could result in more inclusive teams and diversity of thought and innovation

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