2023 Annual Conference & Exposition
Baltimore Convention Center, MD | June 25 - 28, 2023
The Harbor of Engineering Education for 130 Years
Paper ID #38504

Work in Progress: Developing an Ethnographic Observation and Reflection Template: An Example from Studying Epistemic Differences within EER Teams

Ms. Isabel Anne Boyd, University of Tennessee, Knoxville

Isabel is a third-year student at the University of Tennessee, Knoxville studying biomedical engineering. She has conducted several mixed methods research projects centered around diversity and inclusion in engineering and is interested in pursuing a Ph.D. in Engineering Education.

Chulin Chen, University of Tennessee, Knoxville

Chulin Chen is a Ph.D. student in the Department of Industrial and Systems Engineering at the University of Tennessee, Knoxville. He earned his BS and MS in Industrial Engineering and his research interests focus on applying industrial engineering tools and systems thinking approaches within the context of engineering education.

Lorna Treffert, University of Tennessee, Knoxville

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.

Alexis Gillmore, University of Tennessee, Knoxville

Alexis is a PhD student in soil science - they also teach interdisciplinary senior design and are pursuing a certificate in engineering education

Dr. Courtney June Faber, University of Tennessee, Knoxville

Courtney Faber, Ph.D., is a Research Associate Professor and Senior Lecturer in Engineering Fundamentals at the University of Tennessee, Knoxville. She is 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 cognition. 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.

WIP: Developing an Ethnographic Observation and Reflection Template: An Example from Studying Epistemic Differences within EER Teams

Abstract

In this work-in-progress paper, we describe the process we used to develop a fieldnotes template to support our ethnographic study of how interdisciplinary engineering education research teams use their unique perspectives to negotiate epistemic differences. We observed six virtual team meetings of an established interdisciplinary engineering education research team. The meetings we observed occurred between December 2019 and April 2020. In addition to conducting and discussing observations, our research team read empirical and theoretical articles to gain an understanding of Longino's critical contextual empiricism model. We also co-constructed pictorial systems maps to understand and define the social reality we are studying. These efforts directly supported our discussions about how the group interacted, the types of conversations they had, and instances that suggested possible differences in epistemic identities. From our initial observations, team discussions, and consideration of the social reality, we created a template for taking fieldnotes. These fieldnotes have three sections to help guide our observations and analysis. The sections focus on relevant identification and classification of the meeting purpose and date, specific instances of epistemic discussions, and reflection questions to help us interpret these interactions. We are currently testing our template by observing more team meetings and discussing how the template works and does not work.

Introduction

Engineering education research teams are often composed of members from different disciplines. This interdisciplinary structure can bring a wealth of knowledge and perspectives but can also lead to challenges that hinder effective collaboration due to epistemic differences. These differences appear in the approaches, values, and points of view of individual researchers toward how knowledge is generated, expressed, and applied. If these differences in thinking are not effectively addressed and negotiated, they can compromise the success of a research team and hinder positive changes in the field of engineering education. Understanding how research teams negotiate epistemic differences is critical for developing strategies to overcome barriers to collaboration, negotiation, and knowledge generation.

Epistemic differences can be difficult to study due to the tacit nature of people's beliefs about knowledge, which results in individuals having a hard time articulating their true beliefs about knowledge. Additionally, the ways in which people enact their epistemic beliefs are dependent on context and situation [1, 2, 3]. So while an individual may report holding a specific epistemic belief on a survey or in an interview, they may not always act in ways that reflect these beliefs. Given these complexities associated with studying epistemic matters, recent trends among researchers call for the use of context and situation-specific approaches [4, 5].

Ethnography offers research methods that allow researchers to deeply consider both context and situation. The general goal of ethnography is to "...discover the cultural knowledge people are using to organize their behavior and interpret their experience" [6, p.30-31]. To meet this goal, ethnography includes methods to understand culture, emphasizes understanding groups by observing individuals and groups as a whole, and integrates both self-report and observations. Combined, these approaches allow for a deeper understanding of tacit beliefs and knowledge.

Ethnography can vary widely in scope, ranging from the study of a complex society to the study of a single social situation. Additionally, ethnography can be topic-oriented and focus on specific aspects that are known to exist in a given community. For a topic-oriented ethnography, it is important for researcher(s) to remain focused on their "topic" when collecting and analyzing data. To stay focused on their topic, ethnographic researchers need to clearly define the social reality they are investigating [6]. One approach researchers can use to define the social reality under investigation is the development of pictorial system maps [7]. These visual representations provide a mechanism for researchers to closely consider the experiences of participants within their area of investigation.

In this WIP paper, we describe our process to develop a fieldnotes template that will be used to study the negotiation of epistemic differences in interdisciplinary engineering education research teams participating in our research. This template provides a structured way to observe and analyze the interactions of the research teams, ensuring that the data analyzed is relevant to the research goals. A key piece of our process was the creation of pictorial systems maps and discussions of these maps as a research team to understand the social reality under investigation. We hope that sharing the process we used will help other researchers who are designing and conducting qualitative research studies.

Method Development

This paper is part of a larger project with the goal of exploring the culture of interdisciplinary engineering education research teams toward knowledge generation, application, and expression. Additionally, we are interested in understanding how these teams navigate differences in thinking about knowledge. Given these goals, we are taking a topic-oriented ethnographic approach to guide our data collection and analysis. We will observe the research meetings of one team over the course of a year. To prepare for these observations, we used existing recordings of research team meetings that occurred between December 2019 and April 2020 to develop and test our data collection approaches, specifically the use of recorded team meetings and a fieldnotes template. This research team included researchers from engineering, engineering education, and educational psychology. They met over the videoconferencing platform Zoom and were working on a project that aimed to integrate engineering education research and practice. The method we focus on in this paper is based on our observations of six recorded meetings that took place during the spring of 2020.

In the following sections, we describe the key steps in our process (shown in Figure 1) of developing our fieldnotes template. Our goal with the fieldnotes template was to ensure that each researcher on our team stays focused on the topic of our study while observing recordings, ensure consistency across observations, and support the identification of trends and patterns across the whole dataset.

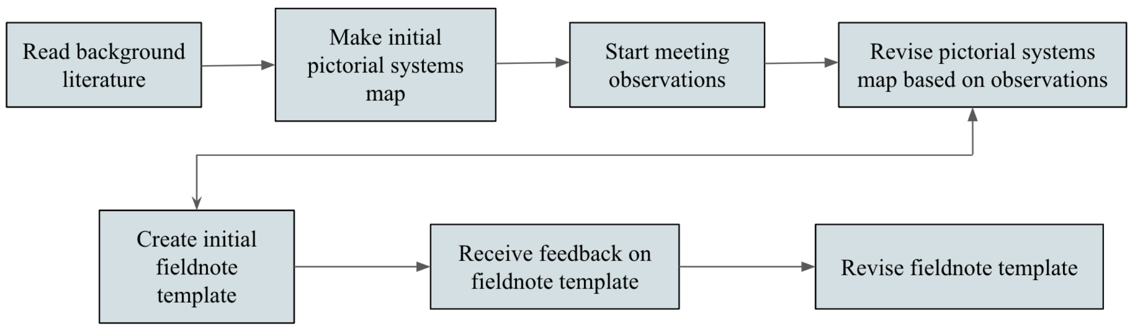

Figure 1: Visual of steps taken to create our fieldnotes template

There were three major components to our process that directly contributed to the development of our fieldnotes template: reading background literature, defining the social reality under investigation by creating pictorial systems maps, and conducting exploratory observations of team meetings.

Reading Background Literature

Our research team divided into two groups: one focused on reading relevant theories and the other focused on reading about ethnographic research approaches.

The group focused on ethnographic research methods and read Spradley's *Participant Observation* [6] and *The Ethnographic Interview* [8]. These research methods resources were helpful in giving us a foundation about how to conduct these observations and recognizing the importance of having documentation from each of our observations.

As we read, we kept notes in a space that was shared across our research team. We also discussed what we were reading and learning during our weekly research group meetings. This initial background reading was crucial in giving our research team a common understanding of the current state of the art of making ethnographic observations.

Defining the Social Reality under Investigation

To define the social reality we are investigating, we created pictorial systems maps. These were based on the Pro-Qual Institute's Experience Near Mapping method [7]. This method allowed us to illustrate the social system we are studying through the lens of participants' experiences: what they see, feel, and think. Specifically, the pictorial maps included the people, artifacts, locations, structures, connections, and interactions of the team. Four members of our research team independently drew their own pictorial system map to represent the social lived experiences of the EER team members while working on a research project. During our research meetings, these researchers presented their maps to the team. As a team, we asked questions, provided feedback, and discussed similarities and differences across the maps. After these discussions, the researchers made revisions to their maps to reflect the discussion and feedback. The process of creating and revising these pictorial systems maps helped frame our thinking around the team members' experiences.

Figure 2 is a representation of the most recent iteration of our system near map. This map has text added for clarity in this publication whereas the actual map is exclusively pictorial. To create our map, we began by identifying the various actors and institutions which felt relevant to our team's functioning: the team members themselves, their departments and institutions, the publications they produce, and the industries connected to their institutions. We then drew out the relationships between these entities. The social reality we are investigating is limited to the interactions between the team members as they are making research decisions and generating knowledge. Finally, we considered reflexive questions each individual member might ask themselves regarding what knowledge and perspectives they are bringing to the team. We also considered what questions each individual member might ask about their teammates as they interact over time. This map helped us to focus our exploratory observations of the team meetings to what roles each team member plays, how they express their thoughts and feelings, and how they negotiate epistemic differences.

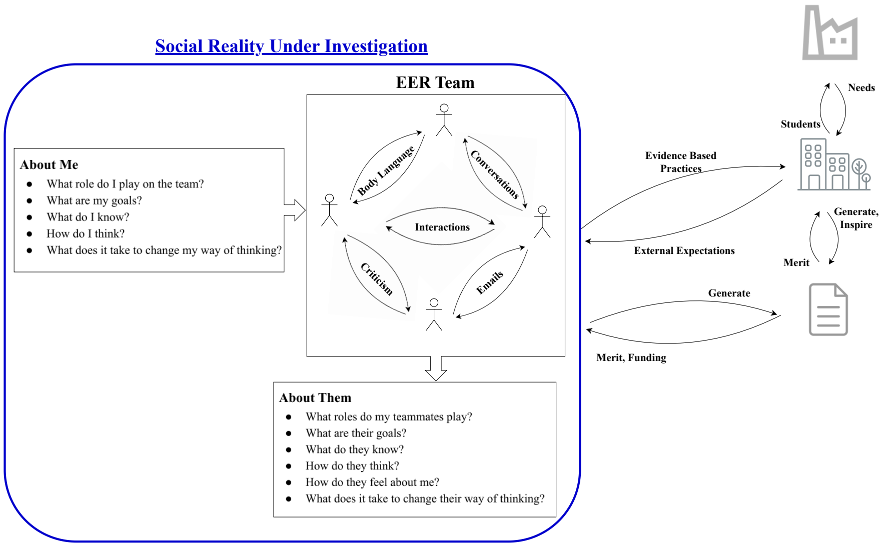

Figure 2: A representation of our system near map. The text was added for clarity in the paper, but our actual map is exclusively pictorial.

Conducting Exploratory Observations of Team Meetings

Because we had an existing dataset of previously recorded team meetings, we were able to conduct exploratory observations without the pressure to document specific information. We conducted these exploratory observations in pairs and kept our own notes as we watched the team meetings. After each observation, we discussed our emerging understandings, takeaways, and questions as a full group. We watched a total of five team meetings using this exploratory approach. After we developed our standard fieldnotes template, as described in the following section, our team went back and formatted these exploratory observations to match the template.

Development of our Fieldnotes Template

During our initial five exploratory observations, each team member took notes as they saw fit. After sharing our individual notes during a team meeting, our team agreed that it would be beneficial to have a standardized template for fieldnotes that specifies what activities and interactions would be worth noting during the observations. We identified two qualities from our initial notes which we felt would be beneficial in a standard fieldnotes template: timestamps and direct quotes. One of our team members, using Emerson's book *Writing ethnographic fieldnotes* [9] as a resource for formatting and content, developed an initial draft of our fieldnotes template. Emerson puts a strong emphasis on "preserving experience close to the moment of occurrence" by simultaneously noting what we, the ethnographer, see and hear (jottings) as well as personal impressions of significance and meaning [9, p.17-24]. Based on this thinking, the team member drafted a template for us to use in our observations.

The initial draft included three sections: general information, fieldnotes, and reflections. The general information section included basic information about the team's meeting (e.g., participant names, dates, and topics). The fieldnotes section was designed to document what was going on at various times during the meeting, using timestamps and direct quotes to provide context and detail. The reflections section includes a list of four core questions for us to consider after conducting our observation and reviewing our fieldnotes to support comparison across team meetings and understanding each member's role on the team. These four questions, aimed at reflecting on moments significant to the enactment of (or lack of) epistemic negotiation are as follows:

1. Which interactions and discussions felt most significant with regards to how the group negotiates epistemic differences?
2. How would you characterize each team member and their roles in the team? How has this observation affected your characterization of them (affirmed, altered, expanded, etc.)
3. What are your impressions of the relationships between team members? How does this compare to prior observations of their relationships?
4. What additional observations, impressions, or feelings would you like to note?

The initial draft of the fieldnotes template was reviewed by the whole research team to ensure that it was comprehensive. During this meeting, we expanded the fieldnotes section to include both quotes and reactions from participants. Adding direct quotes and reactions from meeting participants allows us to denote potentially significant interactions in the words of the participants, without having to re-watch a large portion of the meeting recordings. Having watched several meetings, we noticed that instances of true epistemic negotiation were relatively scarce. However, there were still interactions that felt useful for characterizing the general epistemic culture within the group, how the group approached research design and problem-solving, relationships between group members, and roles assumed by group members. Thus, we added three keys to characterize the nature of significant interactions during the group meeting: discussions (D), interactions (I), and team roles (R). These keys accompany timestamps within the template. Discussions worth noting with the key D should focus on using research approaches, planning, or applying knowledge. If a decision was made as a result of a discussion, we also wanted to note who drove the decision, which team members were involved, and what role they played. We also wanted to note interactions between team members which added to our understanding of their relationships and how they treat/work with other members. We also wanted to note instances that illustrated the role an individual took during the meeting or when they did not participate in a discussion. These additional characterizations allowed us to capture potential barriers to epistemic negotiations.

To keep track of our findings, we created a table of observed instances that contain epistemic negotiations and potentially significant team interactions. This table records the video title, the timestamp of the instance, and a brief description of the instance. This will serve as a useful reference as we analyze several years' worth of data. We also made minor edits to the questions in the reflections section to ensure that everyone on the research team understood the questions in the same way.

Limitations and Future Research

In traditional ethnographic research, observations are conducted in real-time and researchers conduct follow-up interviews to gain additional insight into the motivations behind the behaviors and conversations they observe. For this work, we observed research team meetings that were recorded nearly three years ago. Due to the gap between the actual team meeting and our observation, we were unable to follow up on specific instances. We plan to use follow-up interviews during our future real-time team observation to help us better understand the participants' perceptions and any situational factors that might influence how individuals enact their beliefs about knowledge. These insights will be important for us to document and include in our ”ethnographic record” [6]. It will also be important for us to develop procedures that support our consideration of the interview data alongside the meeting observation data.

The team meetings that we observed occurred during the early stages of the COVID-19 pandemic. During this time, instruction had rapidly switched to online and people were working from home. These factors, as well as others, added increased stress and demands on people. We do not know the specifics of how the team we observed was affected by the pandemic at the time of the meetings we observed; however, we think it is important for us and others to keep this context in mind. Additionally, the fieldnotes template we developed was based on five observations of a single team. This limited dataset means that there might be other factors we should pay attention to during our observations that are not included in the current version of the template. As we continue to observe research team meetings, we will consider expanding our fieldnotes template to include aspects that might not have been relevant in the meetings we observed.

We think it is important for researchers to share ongoing details about their research methods and the process they are using to develop these methods. Sharing these details in an ongoing manner helps newer researchers see how methods and studies are developed and provide opportunities for the research community to give feedback on methods prior to the publication of the research results, allowing researchers to make changes to their methods. Since we are in the early stages of this project, we do not know how the fieldnotes template we share in this paper will support our research efforts. We see our fieldnotes template as a living document that we will change as we continue our ethnographic study.

Conclusions

This paper describes the process we used to develop a fieldnotes template. This template provides a systematic and structured approach to observing and analyzing team interactions and conversations centered around knowledge. Our research team will use this fieldnotes template in our work exploring how interdisciplinary research teams negotiate their epistemic differences. It also provides a foundation that other researchers can expand on to study the epistemic culture of groups in similar but different contexts (e.g., engineering student interdisciplinary design teams). Additionally, the overall process we used to develop our fieldnotes template through the integration of background literature, pictorial systems maps, and exploratory observations can guide researchers who are new to qualitative research and are developing the research methods for their studies.

Acknowledgement

This research was funded by the National Science Foundation CAREER Grant No. 2144698. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. We would like to express gratitude to the research team who provided their recorded team meetings for us to study. We would also like to thank Dr. Nicola Sochacka for her insightful feedback and discussions as we developed our initial fieldnotes template and sought to define our Social Reality Under Investigation. Finally, we would like to thank the members of the ENLITE team who gave feedback on the drafts of this paper.

References

[1] Measuring epistemic thinking within and across topics: A scenario-based approach. *Contemporary Educational Psychology*, 42:141–158, 2015. ISSN 0361-476X. doi: https://doi.org/10.1016/j.cedpsych.2015.06.006.

[2] Clark Chinn, Ronald Rinehart, and Luke Buckland. *Epistemic cognition and evaluating information: Applying the AIR model of epistemic cognition*. 01 2014.

[3] Sarit Barzilai and Anat Zohar. *Epistemic (Meta)cognition: Ways of Thinking About Knowledge and Knowing*, pages 409–424. 02 2016.

[4] Gregory Kelly. *Methodological considerations for the study of epistemic cognition in practice*, pages 393–408. 02 2016. ISBN 978-1-138-01340-7.

[5] Gregory Kelly. *Theory and methods for sociocultural research in science and engineering education*. 01 2019. ISBN 978-0-81535189.

[6] James P Spradley. *Participant observation*. Waveland Press, 2016.

[7] Nicola Sochacka and Joachim Walther. *The ProQual Institute for Research Methods*. Oct. 13, 2021.

[8] James P Spradley. *The ethnographic interview*. Waveland Press, 2016.

[9] Robert M Emerson, Rachel I Fretz, and Linda L Shaw. *Writing ethnographic fieldnotes*. University of Chicago press, 2011.

Appendix A: Fieldnotes Template

Observer:

Linked observation notes:

Observation Date:

Meeting Observed:

Participants:

Project Status:

- Key action items proposed/completed

Field Notes

Throughout your field notes using timestamps and include participant quotes and reactions (verbal and physical/emotional) and your own general impressions/feelings

Example format: 12:35 - (D) - add your description

- Discussions (D) that focus on using research approaches, planning, or applying knowledge
    - Make note if a decision was made, what drove the decision, who was involved, and how they were involved
- Interactions (I) between team members, especially ones that add to our understanding of:
    - The relationships between team members
    - How individuals treat/work with other people
- The role individuals (R) take in/during the meeting
    - The team member's role in the group
    - Individual's willingness to participate

Reflections

- Which interactions and discussions felt most significant with regards to how the group negotiates epistemic differences?
    - Are these topics new, previously discussed, or emergent from prior discussions?
    - How have these interactions compared to prior observations?
    - Are there any patterns emerging or are there exceptions to observed patterns?
- How would you characterize each team member and their roles in the team? How has this observation affected your characterization of them (affirmed, altered, expanded, etc.)
- What are your impressions of the relationships between team members? How does this compare to prior observations of their relationships?
- What additional observations, impressions, or feelings would you like to note?