



Building a Community of Practice: Discipline-Based Educational Research Groups

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Engineering Education is a growing field. Twenty-three universities have doctoral programs in engineering education while numerous others offer certificates, courses, or the option to pursue engineering education research in traditional engineering disciplines.¹ Sixteen institutions have ASEE Student Chapters, offering another way for students who are interested in engineering education research to meet and form a community of practice.² For some, however, there are no avenues to interact with others involved in educational research. This paper provides another source for creating a community of practice for those involved in engineering education research.

A community of practice is an informal social learning system where members find a sense of belonging due to a shared topic of interest.³ Communities of practice can be informal, such as groups of hobbyists learning about their chosen hobby, semi-formal, such as journal clubs in graduate school, or formal, such as corporate communities working to create better products. A community of practice helps those interested in a new topic to learn more about their chosen area and allows those with experience to pass on their knowledge. Being a part of a community of practice an important way for graduate students to understand the norms of the research community they are entering. This includes how to perform and present research, discuss ideas with others, and learn and grow in their chosen area. Much of the information within areas of practice is tacit, not explicit, and to become an experienced practitioner, one must learn this tacit knowledge as well.⁴ A community of practice will help to instill this tacit knowledge into new practitioners, allowing them to become experienced in their chosen field. Joining a community of practice is more important for new engineering education researchers as they are often coming from a post-positivist engineering background and are now attempting to interact in a more constructivist realm with different norms and ideas of what rigorous research can be. Understanding and performing these new norms quickly helps new engineering education researchers to become active members of the broader engineering education community.

Literature Review

Wenger, McDermott, and Snyder have created a framework for understanding and cultivating communities of practice.⁴ A community of practice has three main requirements: Domain, community, and practices. The community must specify the domain of interest and have a common area of knowledge all members are interested in learning about and working in. A shared interest is not enough to create a community of practice. There must also be a sense of community, allowing members to feel comfortable with open discussions and free inquiry. The third main component of a community of practice is the set of practices common to that community, including common language, procedures, required evidence, and other ways of knowing and doing that practitioners of the field use. Community practices can include explicit and tacit information, from commonly used tools and documents to ways of knowing and analyzing information. In addition to these basic components of a community of practice, members must derive value from the field in order to take part, whether that is the knowledge and experience gained by working with members, satisfaction in teaching newer members, or simply the sense of community they gain by spending time with others who are in their chosen field.

Engineering education is a subset of a growing area of educational research commonly known as Discipline-Based Educational Research (DBER). DBER scholars combine content knowledge in their discipline with pedagogical content knowledge and research in the learning sciences.⁵ For those who do not have strong engineering education communities of practice on their campus, DBER scholars represent a wider community of practice incorporating others studying education in STEM fields.

Many DBER scholars are a small subset of their department, for example, some may study Chemistry Education within the Chemistry Department, following the same requirements as a traditional Chemistry PhD student while focusing on the educational aspects of their field. DBER organizations can bring together scholars who are struggling to understand the new paradigm in their own field to create a broader sense of community and learning. A strong community can provide support, both emotionally and academically, contributing to the success of graduate students who may not have such support structures in their own departments.

Method

This study employs a case study methodology, using multiple sources of data to form an understanding of the research focus.⁶ Sources of data include electronic artifacts, a focus group, and observations from meetings as a participant observer.⁷ Electronic artifacts range from e-mails of group meeting topics, PowerPoint slides from presentations, and documents available to the group.

The focus group had six participants, one male (participant F) and five female (participants A-E), with over-representation of one major. Due to the makeup of the organization, majors are not reported to keep participants anonymous. Five of the members were long-time participants while one was a first-year PhD student and new to the organization.

The author has been a part of the organization from the beginning, incorporating experiences as part of the group as a participant and fulfilling the role of participant observer. While this creates a level of subjectivity in the research, the author has used participation in the group as a way to fill in objective details where needed and allows the focus group to be the basis of subjective discussion of the DBER organization.

Context

At one large Midwestern research-focused university, DBER graduate students have joined together to create a community of practice through a club that meets biweekly. This organization is still fairly new, created in 2013 by students from multiple majors. At this university, there are many STEM majors that have education focused research, however most of these majors have only one or two faculty members in this area and fewer than ten graduate students, as few as one or two in the case of certain majors. Eight majors have been represented by DBER club participants.

Results

The DBER group has all of the requisite elements of a community of practice. The domain, community, and practices of this organization will be presented, along with a discussion of additional findings from the study.

Descriptions of DBER

All participants of the focus group were asked to write down three words to describe the group. The words often aligned with the three main requirements of a community of practice (excepting the word *food*).

Domain: Three participants wrote *interdisciplinary* and two others wrote *educational*.

Community: All participants wrote at least one word relating to community. These included *friendly* (2), *welcoming*, *community*, *supportive*, *diverse*, and *informal* (2).

Practices: Two participants wrote *discussion-based*; one also wrote *thought-provoking*. Another wrote *open-minded*.

Without knowing the formal requirements for a community of practice, members described the DBER group as a community of practice incorporating an educational, interdisciplinary domain, a supportive, open community, and member practices that result in thought-provoking discussions. In addition to their descriptions of the organization, discussion during the focus group and other data further defined the domain, community, practices, and other aspects of the Discipline-Based Educational Research group.

Domain

The DBER group often calls itself a “STEAM” focused educational research group, meaning Science, Technology, Engineering, Agriculture, and Mathematics discipline-based educational research. Students from the College of Education are welcome as their research overlaps in many ways with DBER activities, but few have attended meetings and those who have do not typically return. This organization’s domain is clearly educational research in STEAM domains.

Community

At least one meeting per semester is intended as a purely social gathering to allow members to meet in an informal setting. When asked to discuss meetings that were particularly enjoyable, multiple members discussed a particular social event.

“The social at your house!” (*participant A*)

“Yeah, I was going to say the social!” (*participant C*)

“Which helped strengthen the community of DBER.” (*participant B*)

Some members have a community within their own major, “We tend to interact fairly frequently, in lab groups,” (*participant F*), “A lot of it is informal, like talking in the hallways, or stopping by someone else’s office, it’s not always formal,” (*participant B*) while others do not have that luxury, “there’s no one else who does [redacted] education and that’s partially why we started the group” (*participant A*). For many members, the DBER meetings are their main source of community with other educational researchers.

Practices

Meetings include sharing educational research practices and critiquing presentations made by students for other events, sharing the educational practices to create a common practice in educational research by the community.

“And all the time we gave feedback to people giving presentations” (*participant A*)

“Especially if an older student gave feedback” (*participant F*)

Providing feedback helps to create and enforce the practices in educational research and the DBER community of practice. The practices of the community include what is acceptable in presentations and more experienced members providing feedback (i.e. information on how to better align with the norms) enforces these norms.

“The theoretical framework discussion we had last semester went fairly well, people would present what they knew about a theoretical framework that they chose from their perspective in their field” (*participant F*)

“We had some pretty good discussion comparing between departments” (*participant C*)

These practices are especially important for members who are taking part in interdisciplinary conferences and those who do not have a strong community of practice in their discipline-specific educational research, “No one else in my department does education...so no other graduate student does education in my field and no professor including my own understands it...so it’s nice to come to a place and go, oh, I’ve run my ideas by you, oh, that’s what a theoretical framework actually is” (*participant A*). These meetings help to practice the norms within the community to prepare for wider events like conferences.

Value Added

A community of practice must provide some value for its members. This community provided social and scholarly value for its participants. A list of classes with recommendations and course descriptions is maintained in a Google spreadsheet for members, by members. Participants were able to fill out a Google document with themes they wanted to see presented at meetings and other members could sign up to lead these meetings based on expertise or interest and willingness to lead the discussion.

“The topics were very interesting. We had some very good discussions, particularly on theoretical frameworks last year. It was really helpful to hear from all these different perspectives in the different fields and how each field views different terminology. It was very enlightening, especially if you’re going to present at an interdisciplinary conference to know what kind of perspectives people are coming from” (*participant B*)

Most of the majors represented by DBER members are educational researchers within other departments. These meetings allow for interaction with the wider educational research community as well as add academic value through discussions on research-focused topics. Students from the College of Education are outside of the domain of this

organization, as noted earlier, however there is one other group that shares the same domain, community, and practices but does not tend to participate in the DBER group. One of the disciplines is a standalone department, focusing on their discipline-specific educational research. Students from this area find they have a more specific community of practice available to them within their department and few join the DBER group. Those that continue to take part do so because of the added value of the group academically and socially.

Recommendations

A Discipline-Based Educational Research group can take many forms depending on institutional needs. What has worked for this particular organization may not be successful in other institutions. The basic needs of a community of practice must be met. To meet these needs, a DBER organization must:

1. Define the domain of interest
“Discipline-based educational research” is a fairly broad area, and can be broadened to “educational research” if there are few DBER scholars in any one institution. The community of practice can be open to anyone who is interested in the target domain, however the target domain should be defined in order to create boundaries for the community.
2. Create a community
Include some social events or situations to allow members to get to know one another. An open environment is important for open inquiry to occur. This can mean specific events with a social purpose or a time before or after the meeting where members are free to interact. Find members of your community through networking, from shared classes to speaking to the students of advisers working in DBER areas.
3. Identify shared practices
Graduate students from different disciplines and research traditions will bring different practices to the community. The community should document their practices and community knowledge in some way to allow future participants to be full practitioners in the community as quickly as possible.

In addition to the requirements of a Community of Practice, there are additional recommendations that have worked for this particular DBER organization

4. Food is welcome at meetings
Graduate students tend to have a greater interest in meetings when there is food involved.
5. Homework is unwelcome
Meetings that require readings before attending have few participants, however meetings that explain important documents are very helpful. The “DBER Report”,⁵ the Next Generation Science Standards,⁸ and the Common Core Standards for Mathematics⁹ have been presented at meetings. Students who had read these were able to contribute to the discussion and many who hadn’t attended the meeting to learn more about these influential documents.
6. Flexibility is key
Flexibility in meeting times, topics, and participants has been central to the success of the DBER group. Meeting times tend to change each semester as the graduate students

involved take different courses and have different schedules. The frequency of the meetings, while optimal at twice a month, changes based on student needs. A core group of members attends most meetings, while others participate peripherally and new members are welcome at each meeting.

7. Shared leadership can be helpful

For this organization, there has been one main student leader with a few others assisting in setting meeting dates and agendas. The leadership during meetings has rotated. Different students have presented on various topics including national reports, practiced their dissertation proposals or conference presentations, or led discussions on educational research methods.

8. Understand your group's interests

Every institution will have different needs that can be met through a broader community of practice. Finding engaging ideas and projects for members is key to continued membership and attendance.

Finding members of the DBER community to form a community of practice can be difficult. Places to look for DBER scholars include:

- Known discipline-based educational research faculty and their research groups
- Common educational courses that DBER scholars might take (e.g. research methods courses)
- Educational research presentations by graduate students
- Member searches of professional society databases (e.g. the ASEE Member Database is institution-searchable)
- Ask departments that commonly participate in DBER to see if there are faculty or student contacts with education-based research interests (e.g. physics, chemistry, math, engineering; departmental secretaries are helpful!)

Discipline-based educational research communities of practice will look different at every institution. The boundaries of the domain of interest may change, the community itself will have a different dynamic, and the community's practices will reflect the differences the members bring to the organization. The recommendations and experiences presented in this paper focus on what has worked for one particular community of practice.

References

- [1] Carberry, A., "Engineering education departments and programs (graduate)", *engineeringeducationlist*, 2011.
- [2] "Student chapters": ASEE Student Division, 2014.
- [3] Wenger, E., "Communities of practice and social learning systems", *Organization* Vol. 7, No. 2, 2000, pp. 225-246.
- [4] Wenger, E., McDermott, R. A., and Snyder, W., *Cultivating communities of practice: A guide to managing knowledge*: Harvard Business Press, 2002.
- [5] National Research Council, *Discipline-based education research: Understanding and improving learning in undergraduate science and engineering*, Washington, DC: The National Academies Press, 2012.
- [6] Yin, R. K., *Case study research: Design and methods*: Sage, 2009.

- [7] Yin, R. K., *Qualitative research from start to finish*: Guilford Press, 2010.
- [8] NGSS Lead States, *Next generation science standards: For states, by states*, Washington, DC: The National Academies Press, 2013.
- [9] National Governors Association Center for Best Practices, and Council of Chief State School Officers, *Common core state standards for mathematics*, Washington D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers,, 2010.