Board 116: Lessons Learned: Building Our Capacity to Engage in Engineering Education Research

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Background

This lessons-learned paper documents ongoing work to formalize a community of practice around engineering education research, primarily composed of teaching and research faculty at Northeastern University.

At the national level, there has been a significant investment in changing the way we teach engineering in higher education. As a result, there has been an increase in the number of programs that support the implementation of evidence-based teaching practices, scholarship of teaching and learning, and engineering education research. While these formal programs are undoubtedly valuable, developing these initiatives poses significant challenges for institutions. Moreover, a structured approach is limited in its potential for transformational change. A more organic alternative approach may find application in a wide variety of institutional situations, through the development of a community of practice around engineering education research.

This work takes place at a private Tier 1 multi campus global research university that does not currently have a dedicated engineering education research program. The primary campus of the university is in the northeastern United States, with multiple campuses located around the country, as well as internationally. This paper is situated in the area of communities of practice, and documents our efforts over the course of a year to plant the seeds for such a community to grow organically within our institution.

Selected Literature Review

To support the development of a community of practice, we designed a set of engagement experiences which could help to build stronger connections within our peer group at the university. We turned to the literature to determine the existing state of practice in developing these groups, in the hopes of facilitating meaningful connections. While groups similar in form to a community of practice have existed for a long time, most authors cite the coining of the term to Wenger's research spanning the 1990s [1]. However, there is a body of literature that takes issue with Wenger's original definition of a community of practice, and complaints have been levied that the effectiveness of these groups is difficult to assess given their considerable variation in both structure and function [2]. The idea is broad enough to encompass many different iterations that each call themselves a community of practice, which is valuable, but the literature has difficulty identifying forms and methods which lead to favorable outcomes due to this variability. As an example, the ASEE PEER database lists nearly 100 papers per year for each of the last six years that include the specific phrase "community of practice."

On a more positive note, a number of articles confirmed our expectation that those who engage with this type of group find that it reduces isolation and allows some participants to expand both teaching and research capabilities [3], [4]. This is the heart of why we were drawn to forming a

community of practice, with an earnest goal to connect and complement each other's research efforts rather than paralleling them.
A final note from the literature that sparked some reflection is the idea that communities of practice tend to form more often in a workplace environment than in formal school education [5]. Many of the members of our group are faculty with significant teaching loads, who practice a more traditional kind of knowledge transfer within our classes each week. When it is then our own turn to seek out new knowledge, we instead choose an informal, collaborative communication format. While it is outside of the scope of this paper, there is a fair amount to unpack about how, as older adults, we balance companionship as an equally important value along with knowledge gain. It is possible that more reflection is needed on the needs of our students, and the potential exists to incorporate more companionship components into their learning experience alongside the knowledge gain.

Project Purpose

Engineering education research is of broad interest within the College of Engineering at Northeastern University and individual faculty across disciplines are already engaged in robust education research. These efforts are most often run in parallel, duplicating much of the effort involved, and much can be gained by coalescing these disjointed efforts to build our shared capacity. On campus services exist to support the improvement of teaching and learning for faculty new to this area of scholarship, such as the Center for Advancing Teaching and Learning through Research. However, by strengthening connections between seasoned faculty, and highlighting the rich theoretical underpinnings of the field of engineering education, we have the potential to take the scholarship of teaching and learning within the community of engineering faculty at our university to the next level. In the long run we hope to bolster our community, and position Northeastern University to play a leading role in the formal engineering education research and practice discourse community.

Project Description

Our initiative was launched with the award of an institutional "mutual mentoring" grant of $3,000. After bringing together a core group of interested members, we brainstormed a set of activities around which to frame our community-building experience. The larger community of faculty engaged with engineering education was surveyed about key interest areas for talks and workshops, and three external speakers were selected to present remotely during the fall semester. The spring semester follows up on this speaker series with an on-the-ground workshop. A graphical representation of our plan of action is included below in Table 1.

Table 1 Simplified chart for mutual mentoring program

	Task	Spring-Summer 2022	Fall 2022	Winter-Spring 2023
1	**Building a Program**	Conduct interest survey. Identify speakers. Plan overall programming.		
2	**New Ideas and Connections**		Advertise and run speaker seminar series. Distribute books.	
3	**Maintaining Momentum**			Hold final workshop. Write final report. Hold "next steps" meeting to reaffirm collaborations.

Our central goal was to cultivate an engineering education research community of practice at Northeastern University. The mechanism established to support this fledgling community was a program of speakers to provide community experiences that enhance professional development, while laying the groundwork for continued collaborations. In the short-term, success was focused on broad faculty participation in the programming. It was our hope that new partnerships be forged through this process and for collaborations to persist beyond the initially funded programming. Through continued engagement, rather than a single workshop or event, we sought to enculturate new and developing researchers in engineering education into the formal discourse community.

Initially, the core group gathered to brainstorm likely topics of interest to the broader community at Northeastern University and collected feedback in the form of a survey from the broader community about potential speaker and workshop topics. The short list of topics included:

- How to build collaborations with peers around engineering education research.
- Getting started with research methods in engineering education.
- Improving or expanding on an existing engineering education research agenda.
- How to take what happens in the classroom and turn it into scholarship.
- How to identify research best practices for pedagogy and implement them.

The community responded with a desire to focus on (1) getting started with research methods, and (2) turning what happens in the classroom into scholarship. This feedback informed how the speakers were selected for the program.

One very modern issue faced by this endeavor was the decision to hold the presenter series online or in person. The community-building aspect of the program would have benefited from onsite presentations, but a number of factors motivated our decision to go remote. High on the list of concerns were the presence of faculty involved in the program on multiple campuses and pandemic-related travel issues. While the community-building efforts may have suffered some from online meetings, we were able to bring in a much broader collection of speakers once travel was not a factor.

After providing a modest token of appreciation for our guest speakers, the lack of spending on travel allowed us to be more creative with the award. We invested in education research books for participants for reference as they advance in the field. Finally, we were able to randomly award ten memberships to the American Society for Engineering Education for members and participants.

Featured Community Events

The first speaker chosen was a professor and department head for an engineering department located at a university in the United Kingdom. The presentation focused on their development of an interdisciplinary engineering program that serves as something of an extended first-year engineering program, providing problem- and project-based work for students in their first two years of school before they matriculate into a traditional engineering discipline. The follow-up book purchased for attendees who wanted a copy was Wenger-Trayner et al.'s "Learning in Landscapes of Practice" [6].

The second speaker was an associate professor within a department of engineering education at a university within the United States. The second talk explored intersections between systems thinking, community engagement, and collaborative change within and beyond engineering education. The follow-up book dispersed to supplement the talk was "Thinking in Systems" by Meadows [7].

The third and final talk featured two speakers, one a clinical associate professor in biomedical engineering, and one an assistant professor in engineering education, both from the same institution within the United States. The focus for the third discussion was a research collaboration between the disciplinary faculty and the engineering education faculty, investigating inequities in undergraduate workforce opportunities between various majors within the university. The research itself was interesting, but just as important was the model for collaboration and cooperation between education and disciplinary faculty within engineering. The final book dispersed as part of the speaker series was "Salsa Dancing into the Social Sciences" by Luker [8].

The culminating event, at least in terms of budget for the program, was a networking and engineering education meet-up open to everyone who participated in the presentations throughout the fall semester. Backgrounds of the dozen people attending ranged from a faculty member currently serving in the Provost's office who has extensive experience in scholarship of teaching and learning, to post-doctoral students who have done disciplinary research in engineering but have an interest in engineering education research. During the meet-up, the core faculty who organized the initiative engaged with the community in a broad discussion of engineering education research, and what that might look like at Northeastern University. The group also brainstormed shared research questions and potential opportunities for collaboration.

Lessons Learned

Evaluating our success

Recall that our central goal was to cultivate an engineering education research community of practice at our university. This is naturally an ongoing and evolving process, so it is challenging to measure our success in finite terms. Instead, we can benchmark where we are along the journey and consider the success of this first initiative. One way we have done this is by looking to models at other institutions that have an active and connected engineering education research community. While we cannot say we have reached these ideals, we can see that our online community established in Microsoft Teams has around 30 members at this time and continues to grow. Members have been posting and interacting around engineering education topics such as publication venues and conference deadlines. Another relative indicator of success is the fact that a member has taken on the initiative of starting a journal article reading club. We've also had several "next steps" meetings with a core group of interested individuals identified through this programming.

Overall, the first phase of development for our community of practice, putting to use the seed funding from the Provost's office, went well. The guest speaker events were relatively well attended and worked as well as they could have, given the various constraints of budget and attendees on multiple campuses.

Participant feedback

In the interest of maintaining an organic and conversational flow to our programming, we decided not to formally survey participants. Since this was really a grassroots effort to gain as much interest and support as possible, we were also cautious of asking too much of our participants at this stage. Anecdotally, we received a great deal of positive feedback about the programming, particularly from our group of final workshop attendees. For instance, the books and ASEE membership giveaways were greeted with enthusiasm. This was expected as most of the people engaging with our programming were non-tenure track faculty with less resources at hand for conducting research in engineering education. It was also meaningful that participant questions at the workshop demonstrated genuine interest in pursuing further research. Towards the end of the workshop, our discussion became guided by these questions and we covered a wide range of topics including advanced issues, for example, positionality and how to apply theory.

What would we do differently?

There are several things we would approach differently if we could launch this initiative over again. We believe there is a good amount of Zoom fatigue being felt by most these days, and the in-person workshop at the end generated more conversation and genuine connection between attendees than the virtual speaking events. While continuing to provide accommodation for faculty on the various campuses, in-person meetings may be the preferred route moving forward.

While we did coordinate with college administration for advertising the talks, getting a strong attendance was still a struggle. Our college sometimes has speakers at the regular college faculty meetings. This could have been an opportunity to combine events and have a shorter talk presented at this meeting that many faculty already attend, rather than adding something extra to

their schedules. We also could have connected with our university's center for teaching and learning, to see if they would be willing to co-sponsor the events.

Future Vision

The purpose of presenting this work at ASEE is to provide a roadmap for other faculty interested in organically strengthening the ties between their own communities of engineering education researchers. It is our hope that through community building that we, and other universities, might increase collaboration in the area of engineering education research, expanding and improving upon the current research being conducted in a more isolated fashion.

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