Insights from a Multi-Institutional Virtual Engineering Education Graduate Program Showcase

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Design and Evaluation of a Multi-Institutional Virtual Engineering Education Graduate Program Showcase

Introduction

This Evidence-Based Practice paper seeks to present results of a multi-institutional virtual graduate program showcase by presenting evidence from the perspective of the prospective students.

Over the last two decades, the engineering education community has accomplished the call by Haghighi [1] to orchestrate research efforts, program developments, and curriculum updates. Today, the engineering education discipline has grown substantially with close to two dozen doctoral education programs in the United States. However, being a relatively new discipline, engineering education is often discovered by chance among prospective doctoral students. Even when prospective graduate students are familiar with the discipline, it is time-consuming and challenging for them to attend multiple open houses, gather information to compare different programs, and identify the ideal fit in alignment with their future personal and professional goals. From the perspective of the program administrators there are benefits as well as tensions between collaboration and competition as the number and size of graduate programs continue to grow. In addition, small programs and newly launched programs can offer unique opportunities yet may have limited access and visibility to prospective graduate students.

Moreover, the body of research on recruitment and program choice in doctoral education is emerging, especially as compared to such research in undergraduate education [2]. Engineering education can contribute to the body of research while learning from research on attrition and retention of minoritized graduate students [3]. In the case of doctoral education in engineering education, there is a necessity for the programs to collectively advertise the discipline as well, not just their specific programs. Attention to institutional choice for graduate students is necessary for all graduate administrators to identify the reasons students apply to and select their institutions, but also situate their niche within the discipline.

Motivated by our collective duty to collaborate towards preparing future leaders in engineering education, a multi-institutional graduate program showcase was held on September 25th, 2023. We examined the value of this showcase by answering two evaluation questions:

- How do students value the opportunity to engage with diverse graduate programs in a single session?
- To what degree did the virtual multi-institutional showcase on engineering education graduate research programs achieve its stated objectives?

To answer these questions, we leveraged Kirkpatrick's evaluation model [4] and survey responses from students.

Framework

Evaluating graduate recruitment events involves assessing multiple aspects to determine effectiveness in attracting and engaging potential candidates. Various models provide structured frameworks for assessing distinct aspects of such events. This study utilized Kirkpatrick's four levels of training evaluation [4] to identify short-term results of the multi-institutional graduate program showcase.

Kirkpatrick's model serves as a comprehensive framework for a systematic examination of participants' immediate reactions (level 1), knowledge and skills acquired (level 2), behavioral changes (level 3), and the overall impact on engineering education programs (level 4) [4]. Table 1 describes how each level can be applied to the multi-institutional graduate program showcase.

Table 1. Kirkpatrick's Evaluation Model [4] Applied to a Multi-institutional Graduate Program Showcase.

Level 1: Reaction

- *Objective*: Evaluate participants' immediate reactions to the event.
- *Methods*: Use surveys, feedback forms, or focus groups to gather participants' opinions on the event's structure, content, and overall experience.
- *Indicators*: Positive reactions may include high satisfaction scores, positive comments about the event's organization and content, and expressions of enthusiasm to pursue an (engineering education) graduate program at one of the featured institutions.

Level 2: Learning

- *Objective*: Assess the knowledge and information acquired by potential doctoral students.
- *Methods*: Implement pre- and post-event assessments, surveys, or interviews to measure changes in participants' understanding of the field (of engineering education), research opportunities, and the overall academic environment at different institutions.
- *Indicators*: Successful learning outcomes could be demonstrated through increased knowledge about the programs, their unique features, and potential research areas.

Level 3: Behavior

- *Objective*: Examine how attendees intend to apply the information gained during the event in their pursuit of doctoral studies.
- *Methods*: Follow-up surveys, interviews, or tracking mechanisms to identify whether participants have initiated the application process, contacted faculty members at one or multiple institutions or engaged in further exploration of the programs.
- *Indicators*: Positive behavioral outcomes include increased program interest, submitting high-quality applications, and proactive engagement with program faculty or staff.

Level 4: Results

- *Objective*: Measure the event's overall impact on doctoral student recruitment and enrollment.
- *Methods*: Analyze application and enrollment data for the subsequent academic terms, track the number of qualified applicants, and assess the event's contribution to achieving the recruitment goals of each institution.
- *Indicators*: Successful results include an increase in the number of qualified and diverse doctoral students enrolling in the programs, meeting or exceeding recruitment targets, and contributing to the overall success of the doctoral programs as a collective.

While the scope of this paper focuses on Level 1 results, by applying Kirkpatrick's model to evaluating a graduate student program showcase, program organizers can gain insights into the event's effectiveness at each of the four levels. This systematic approach allows for identifying strengths, areas for improvement, and the overall impact on the recruitment efforts. It also facilitates evidence-based decision-making for refining future recruitment strategies.

Multi-Institutional Graduate Program Showcase Development

The showcase grew out of efforts of information sharing and community started by the Engineering Education Chairs and Heads Association (EECHA), which is a self-organized group of chairs and heads of Engineering Education departments. While the chairs that had formed this group, had met several times, and had a healthy exchange of ideas, it was quickly apparent that the chairs/directors of graduate programs also had issues to discuss and resources that could be shared or developed together. As such a subgroup of EECHA, the graduate program sub-committee, was formed with the chairs/directors of the various engineering education graduate programs in 2022. It was in these meetings that the challenges of Open House events were discussed (among other topics facing the graduate program chairs/directors of the programs) prompted by the recognition of difficulties encountered in 2020-2022 with events being purely virtual, transitioning to hybrid, and then some coming back to in-person. Additionally, the lack of undergraduate programs means that all engineering education graduate programs face the challenges associated with prospective graduate students understanding what engineering education is and where programs exist for graduate study. As the discussion of best practices and sharing of resources for Open House events continued in the group, an idea was proposed for a combined virtual Open House event, or graduate program showcase, for all of the institutions. At the ASEE Annual conference in June 2023, this idea was discussed at the EECHA meeting, and two organizers were selected (Cheryl Bodnar from Rowan University and Senay Purzer from Purdue University, co-authors of this manuscript).

During the various conversations, there were several positive aspects noted about the idea of a collective graduate program showcase:

- Better use of resources as each school only had to contribute to an event, not host an entire event on their own. This could help smaller programs, newer programs, and less resourced programs.
- Ability to not just focus on programs, but also engineering education as a discipline as a means to educate prospective students.
- Ability to help applicants with their application materials by providing information about what committees are looking for in applications and what makes a strong application.
- An event of this type can benefit prospective students as well because they only need to attend one event to get lots of information about many schools.

In July, a call for participation followed through both the graduate program sub-committee and the EECHA list. At that time, ten (10) schools had agreed to participate, and other schools were solicited for participation. Commitment from the schools involved in the event included:

- Providing input on the timing of the event
- Attending a planning meeting for the event
- Providing input on the name of the event
- Providing input on the information collected from prospective students who register for the event
- Volunteering to participate in one of two panels for the event
    - Graduate school application tips
    - Identifying potential advisors
- Providing information for the general overview of Engineering Education or information to help the two panels
- Creating a slide for the institution that included information about
    - Research areas of note for the institution
    - Student experience
    - Unique/differentiating features of the program
    - Types of fellowships and funding
- Advertising using their university's communication and media channels
- Asking faculty at the participating institutions to encourage prospective students to attend

In addition to the participating school's advertising, the showcase was advertised widely through the ASEE's Education Research and Methods (ERM) group listserv, other ASEE listservs, NSBE, SWE, SHPE, the Engineering Education Community Resource wiki, and LinkedIn. It was agreed early that the target audience for the event was all prospective students intending to apply to an engineering education PhD program (i.e., straight from undergraduate, from master's programs, working professionals, etc.). The advertisement for the event that appeared in the ERM mailing (Figure 1), and event flyer (Figure 2) are included for reference.

Seventeen Engineering Education Graduate Research Programs will host a Virtual Multi-Institutional Showcase . The event will be held on Monday September 25th, 2023 from 2:00 – 4:00 pm EST (see the registration form and event flyer for more details). The program includes: (1) an overview of Engineering Education Research as a field, (2) a session on what makes a good graduate application, (3) a session on identifying advisors, and (4) breakout rooms and Q&As. For questions, please contact Cheryl Bodnar (bodnar@rowan.edu) and Senay Purzer (purzer@purdue.edu).

Figure 1. Example advertisement for event from ASEE ERM listserv mailing

In total, seventeen (17) institutions participated in the event on September 25th, 2023, for two hours. The format of the event was as follows:

- Introduction to Engineering Education as a discipline
- Introductions (2-3 minutes each - max 5 minutes) of each of the graduate programs
- Presentation of what makes a good graduate school application
- Panel discussion on identifying potential advisors
- Opportunities for students to talk directly to the faculty from the programs who presented in breakout rooms.

During the event, attendees were encouraged to post questions in the chat. These questions about funding, advisors, programs, etc. were often answered by multiple institutions, giving students a number of different perspectives.

Figure 2. Event flyer for multi-institutional graduate program showcase

In total, there were 94 individuals that registered to attend the multi-institutional graduate program showcase and 45 individuals that were in attendance at the peak of the session. Unfortunately, a technical glitch with the online meeting platform prevented the ability of identifying all 45 individuals in attendance for subsequent post-showcase follow-up.

One of the goals of the showcase was to evaluate "How do students value the opportunity to engage with diverse graduate programs in a single session?" so we provided all participants that attended the event with the opportunity to respond to a 5-minute evaluation survey posted in the Zoom chat during the last 10 minutes of the session (prior to and after breakout rooms). Subsequently, we followed up with all participants that were identifiable in the session to provide them an additional opportunity to complete the evaluation survey if they had not yet responded. The evaluation survey provided participants with the opportunity to share their ratings of the different components of the graduate program showcase, what was most valuable to them, how the showcase could have been improved, to what degree the showcase allowed them to reach intended objectives, and what expectations they had surrounding the showcase and whether these were met. In addition, participants were asked some basic demographic questions to get a better understanding of the individuals in attendance.

We received a total of 15 evaluation survey responses. The participants that responded to the survey were by majority male (9 male, 5 female, and 1 did not disclose) but represent diverse ethnicities (6 Asian, 4 Black or African American, 3 White, 2 did not disclose) with one participant additionally identifying as Hispanic/Latino. Data to discern the proportion of international vs. domestic attendees was not collected.

Table 2 provides the breakdown of responses received to the question "Provide your evaluation of how useful each session that was part of the Virtual Multi-Institutional Graduate Program Showcase was to your ability to gain knowledge about engineering education graduate research programs."

Overall, participant responses to the showcase session evaluation were strongly positive with median values of either 4 or 5, representing Very Good or Excellent. The sessions that received the highest responses were those that provided an overview of engineering education research and the opportunity to interact directly with program personnel in the breakout rooms.

Table 2. Participant Responses to Showcase Session Evaluation

Session Name	Likert Scale Response					Median Response
	Poor (1)	Average (2)	Good (3)	Very Good (4)	Excellent (5)	
What is Engineering Education Research Presentation	0	1	0	5	9	5
Institutional Program Slide Presentation	0	0	2	7	6	4
What Makes a Good Graduate Application Presentation	0	0	4	9	2	4
What Makes a Good Graduate Application Panel	0	0	2	8	5	4
Selecting an Advisor Panel	0	0	2	10	3	4
Breakout Rooms with Institutional Programs	0	1	1	4	9	5
Wrap-Up	0	1	3	8	3	4

Open-ended responses to the survey question "*What was most valuable about the Virtual Multi-Institutional Showcase on Engineering Education Graduate Research Programs in the U.S.? Please describe specific sessions, or other highlights as appropriate"* supported the data found from the quantitative measures. Specifically, participants called out the sessions on advisor selection and the information provided on the application process as shown in these example quotes:

> *"The panel sessions was most valuable for me as questions about what makes a strong application was addressed, in addition to how best to approach potential advisors."*

> *"I had some doubts regarding application procedure and my GPA but because of clear communication and [direct] chat with the college representative itself most of my doubts are cleared and I am confident enough to apply for PhD."*

Although not directly asked about in the evaluation of the sessions associated with the showcase, the participants also mentioned how this type of graduate program showcase was unique in its ability to bring together multiple engineering education graduate programs allowing them to learn about a variety of programs in one setting.

> *"...One of the most valuable aspects of the showcase was the opportunity to see multiple universities and their engineering education graduate research programs all in one platform. This made it convenient and efficient to explore various options and learn about different programs. Specifically, I appreciated the diverse range of sessions and presentations that covered various aspects of engineering education research. It allowed me to gain insights into the research focus areas of different universities and understand the unique strengths and contributions of each program…"*

> *"...Its most valuable aspect was fostering collaboration and knowledge exchange among institutions, educators, and researchers nationwide…"*

With regards to areas of improvement for the showcase, participants mostly shared about needing to have more time in breakout rooms. In some cases, the desire was just for more time without further explanation: *"The breakout rooms sessions should be longer."* In other cases, the request for more time was also associated with an ask for a difference in format regarding increasing one-on-one interaction time: *"I will suggest that more time be [given] for the breakout so the institutions can have a one on one mentorship and application [guidance] to prospective applicants."*

A suggestion that is perhaps beyond the purpose of what this event was designed to accomplish but could be important for individual schools to consider in their respective online open house events is:

> *"... consider adding interactive workshops, diverse session formats, virtual lab tours, international perspectives, industry-academia collaboration discussions, diversity and inclusion topics, structured networking opportunities, post-event resources, a feedback mechanism, and sustainability-focused sessions. These additions would enrich the attendee experience, promote hands-on learning, foster global collaboration, and ensure the event remains relevant and inclusive."*

The next portion of the evaluation survey sought to evaluate the showcase's ability to meet proposed objectives by gathering student ratings for the question *"To what degree did the Virtual Multi-Institutional Showcase on Engineering Education Graduate Research Programs in the U.S. help you achieve the following?"* as found in Table 3.

The proposed multi-institutional graduate program showcase objectives ranged from providing participants with a better understanding of the field of engineering education research to helping them identify programs that would be a good fit for their goals for a graduate degree. A stretch program objective was the ability to create connections with other students interested in engineering education research where it was recognized that the programming itself, perhaps apart from the breakout rooms, may not afford this opportunity but some of the chat related

functions of the online meeting platform may contribute to this occurrence. Median responses obtained showed that overall, the showcase was able to achieve all of the outlined objectives at the level of "A Lot" or "A Great Deal" except for the stretch program objective where the median value was only "A Moderate Amount".

Table 3. Participant Responses to Achieving Proposed Showcase Program Objectives

Question	Likert Scale Response					Median Response
	Not at All (1)	A Little (2)	A Moderate Amount (3)	A Lot (4)	A Great Deal (5)	
Describe engineering education research and its common topic areas	0	1	2	7	5	4
Create a strong graduate application for an engineering education graduate research program	0	0	3	8	4	4
Identify steps to take to help with your advisor selection process	0	0	0	7	8	5
Select a subset of engineering education graduate research programs that align with your goals for a graduate degree	0	0	2	10	3	4
Create connections with other students interested in engineering education research	3	2	3	5	2	3

Participants commented that the graduate program showcase met their expectations and, in some cases, even exceeded what they were expecting. Responses mentioned that in general they had viewed the session as an opportunity to learn about different programs and meet representative faculty from these institutions but that participants were appreciative of some of the other elements included as shared here: *"I expected to hear about different programs and was pleasantly surprised at the panels and informational presentations."*

Responses also reinforced how this graduate program showcase gave the participants an opportunity to learn more about the diverse range of engineering education graduate programs available to select from:

> *"This was very helpful for putting a face to the program and getting to know their essence better! I was able to discover new programs I hadn't previously considered, it met my expectations!"*

Implications for Graduate Student Recruitment Processes

The motivation for the Virtual Multi-Institutional Graduate Program Showcase was to help prospective students find the right program for them to apply to in an efficient manner from student and program perspectives. The event organizers perceived potential benefits for both prospective students and for the programs. For students, the hope was for them to learn about programs as well as application strategies such as writing a competitive application and choosing an advisor. For programs, the hope was that students would have awareness of different programs and choose the programs that could be the best fit for them vs leaning towards the most well-known or largest programs. We evaluated the Virtual Multi-Institutional Graduate Program Showcase using Kirkpatrick's Four Level Training Program Evaluation [4] framework and specifically a Level 1 evaluation, which identifies reactions to the training event (in this case the Virtual Multi-Institutional Showcase). The reactions gathered in this round are from the student perspective and data on the program perspective will be addressed in future work. From the student perspective, we identified implications for students and programs as well as suggestions for future evaluation at increasing levels of Kirpatrick's framework.

Student-Perspective: Implications and Future Work

Prospective students generally had a positive reaction to the Virtual Multi-Institutional Graduate Program Showcase. The responses to closed- and open-ended questions suggest that the program met the advertised intentions of the sessions including: (1) providing an overview of Engineering Education Research as a field, (2) offering sessions on what makes a good graduate application, (3) offering sessions on identifying advisors, and (4) creating interactive time through breakout rooms and Q&A sessions. Suggested improvements included offering more time and interaction in the breakout sessions. While organizers could consider extending the event next year to meet this need, individual programs could also think about how to provide more in-depth interactions.

The one measured objective that was not achieved as successfully as others was creating community. This is not surprising as the current showcase construction did not emphasize this aspect nor intentionally create space to do so.

Data from the student perspective are not sufficient at this stage to know if program needs were met regarding students making right-choices for them. From the current data we know that students reported increased awareness of programs but without program names we do not know if some specific programs benefited more than others.

While the evaluation on this inaugural event suggests it was successful from the student-perspective, future implementations could consider increasing the robustness of the evaluation by moving to Level two in Kirpatrick's framework which measures learning [4]. Such an approach could include gathering data on student knowledge about engineering programs and application processes before and after the event. Level 3 and 4 evaluations would be longer term evaluations

that could consider patterns in where students intended to apply before and after the showcase, where they actually apply, quality of the applications, and satisfaction with the selected program after starting. Such evaluations could enhance understanding of how student and program needs were met by the showcase.

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