

Research Paper: Where Do We Meet? Understanding Conference Participation in a Department of Engineering Education

Mr. Tahsin Mahmud Chowdhury, Virginia Tech

Tahsin Mahmud Chowdhury is a PhD student at Virginia Tech in the department of Engineering Education. Tahsin holds a BSc. degree in Electrical and Electronics Engineering from IUT, Dhaka and has worked as a manufacturing professional at a Fortune 500. He is actively engaged in different projects at the department involving teamwork, communication and capstone design with a focus on industrial engineering practice.

Ms. Ashley R. Taylor, Virginia Tech

Ashley Taylor is a doctoral candidate in engineering education at Virginia Polytechnic and State University, where she also serves as a program assistant for the Center for Enhancement of Engineering Diversity and an advisor for international senior design projects in the Department of Mechanical Engineering. Ashley received her MS in Mechanical Engineering, MPH in Public Health Education, and BS in Mechanical Engineering from Virginia Tech. Her research interests include access to higher education, broadening participation in engineering, the integration of engineering education and international development, and building capacity in low and middle income countries through inclusive technical education.

Dr. Homero Murzi, Virginia Tech

Homero Murzi is an Assistant Professor in the Department of Engineering Education at Virginia Tech. He holds degrees in Industrial Engineering (BS, MS), Master of Business Administration (MBA) and in Engineering Education (PhD). Homero has 15 years of international experience working in industry and academia. His research focuses on contemporary and inclusive pedagogical practices, industry-driven competency development in engineering, and understanding the barriers that Latinx and Native Americans have in engineering. Homero has been recognized as a Diggs scholar, a Graduate Academy for Teaching Excellence fellow, a Diversity scholar, a Fulbright scholar and was inducted in the Bouchet Honor Society.

Desen Sevi Ozkan, Virginia Tech

Desen is a Ph.D. student in Engineering Education at Virginia Tech and holds a B.S. in Chemical Engineering from Tufts University.

Hannah Claire Strom, Virginia Tech

I am currently a Sophomore Undergraduate in Chemical Engineering with an intended Spanish minor at Virginia Tech. I am participating in Undergraduate Research with the Engineering Education department and intend to study Engineering Education in graduate school. I have previously worked as a grader for the Foundations of Engineering Class and assisted teaching Matlab once a week. I also work as a peer mentor for incoming freshman through the Center for Enhancement of Engineering Diversity. I wish to explore more about engineering education throughout my undergraduate career.

Where do we meet? Understanding conference participation in a Department of Engineering Education

Abstract

This research paper focuses on understanding conference participation in a department of engineering education. The Engineering Education community has developed several spaces in the United States and internationally to continuously discuss the trends of the field. However, we wanted to explore if people were participating in diverse conferences beyond the traditional conferences in the field. Nevertheless, engineering educators come from a very broad range of backgrounds, including different engineering disciplines, education, and social sciences. The purpose of this paper is to better understand what type of conferences members of an engineering education department typically attend. Data collected quantitatively in an engineering education department. Results suggest members of the engineering education department are most familiar and attend the traditional conferences in the field (i.e. ASEE, FIE). Among the reasons for making a decision to attend a conference funding and location of the conference were the most important reasons, beyond quality of the conference and speakers participating.

This research paper will be presented as a traditional lecture, however, it will include a portion of the conversation focused on the audience (mini-demonstration). To do that, we expect the audience to engage during the talk by using real-time feedback (e.g. Polleverywhere) and paper surveys (for those that don't have access to technology) to gather their preferences on attending conferences and see how those preferences contrast to the findings of our study.

Introduction/Background

For many decades, engineering education (EE) has been defined as an “emergent field.” However, in the last years, the field has been growing exponentially. According to Borrego and Bernhard [1] engineering education research is crucial in order to solve some of the challenges the engineering field face. In 2009, Jesiek et. al [2] provided a history of engineering education as a field that was “maturing as a research field” (p.39). The authors identified the importance of having discussions about the goals of the field and finding ways to develop identity as engineering education researchers, including infrastructure that supports this development. Later, in 2015 [Authors, blinded for review] conducted a comparative analysis of Ph.D. programs in EE in the United States. The authors identified 4 major EE departments along with several centers to support EE research around the country. Currently, only 4 years later, the field has grown considerably. In recent years, several EE departments have been created around the country, with growing numbers of EE Ph.D. programs and many engineering programs obtaining support from EE research. Even engineering schools that don't have EE programs or centers are hiring EE researchers in the traditional engineering disciplines as it is considered something necessary to advance the way engineers are educated. Since EE is highly interdisciplinary, the implications are that as we grow as a field, the background of the members of the EE community becomes more diverse over time.

The EE community has developed several spaces in the United States (i.e. American Society of Engineering Education (ASEE) annual conference, ASEE regional conferences, Frontiers in

Education Conference (FIE), etc.) and internationally (The Australasian Association for Engineering Education (AAEE) conference, the European Society for Engineering Education (SEFI), and the Latin American and Caribbean Consortium of Engineering Institutions (LACCEI), among others), to continuously discuss the trends of the field, present the research being conducted, and develop and strengthen our community. Nevertheless, engineering educators come from a very broad range of backgrounds, including people from several engineering disciplines, people from different educational backgrounds, people with different social science backgrounds, and even people with many different industry experiences. Hence, researchers have different roots that directly impact the way they conduct their research and the way they share their work. We assume that many will present their work beyond the traditional venues created for engineering education, to better adapt to their disciplinary roots, or to develop connections in different fields required to move their research forward.

The purpose of this research paper is to understand how diverse an EE department is by identifying the different types of conferences where graduate students and faculty members typically present their work. The research question guiding this study is:

RQ: What are the conferences that members of a department of engineering education typically attend to share their work?

To answer our research question, we collected data in one particular EE department as a way to evaluate the program and report back to the field how diverse (or not) the backgrounds of the EE department members are based on the conferences they typically attend. We also decided to focus on conference participation as we consider it is a place highly valued by faculty members and graduate students to develop their identity as researchers. Furthermore, Jesiek et. al [2] highlight the value of conferences as sites for “for learning, networking, sharing results, and collaborating” (p.46).

Review of the literature

Engineering Education, as a distinct research field, emerged around 2003 with the advent of academic departments, graduate degrees, and journals comprising empirical and systematic engineering education research [3]. As the field established itself as a standalone field near 2003, the scope of work changed from descriptive accounts of education to systematic and empirical research [2,4,5]. As an example, even though the Journal of Engineering Education (JEE) has been in publication for as long as a century, editor Edward Ernst in 1993 noted changes as JEE sought to publish “scholarly” rather than “superficial” analysis (Ernst cited in Jesiek et al., [2]). Near 10 years later, large sources of federal funding made it possible for the newly structured research paradigms of engineering education to exist as departments of engineering education, first at Purdue in 2004 and Virginia Tech in 2005 [2].

In the earliest years of the Engineering Education department at [blind for review], the dissemination of research at conferences was limited to the ASEE conference and the Frontiers in Education conference. We are interested in understanding if this is the preference that people in the department still have. In the interest of program evaluation towards continuous improvement [8], the authors have engaged the department in a study to ascertain the number and variety of

conferences attended by its members. An important part of program evaluation is the collection of relevant data coming from different data points [5]. Most program evaluation of the academic departments focuses on evaluating the educational objectives in terms of measuring the level of knowledge and skills attained by graduates as a result of the program [6]. We wanted to take a less traditional approach and evaluate the status of our program in terms of the venues where we are building community. This work serves as an in-house measure to gauge the frequency and variety that those in the Virginia Tech Engineering Education department attend conferences.

Methods

Instrument Development

To address our research question, we developed a pilot survey instrument [Appendix I]. Survey items collectively aimed to create a descriptive understanding of two main topics: 1) participants' familiarity with various engineering education conferences; and 2) the factors that influence conference attendance. Sample survey items are provided in Table 1. Participants were asked to rank each choice (Table 1) on a scale from *not at all familiar* to *very familiar (regularly attend)*. The complete survey instrument is found in Appendix I.

Table 1. Sample Survey Items

Survey Item	Sample Choices
Please rate how familiar you are with the following conferences:	American Society for Engineering Education
	American Educational Research Association (AERA) Annual Meeting
	Frontiers in Education (FIE)
	etc.
Please select what factors are most important to you when making decisions on what conference to attend:	Location
	Quality of the conference (rigor)
	etc.

Participants, Data Collection and Analysis

An Engineering Education (EE) department in a large research university in the southeastern United States served as the research context for this study. Using a cross-sectional design [7], quantitative data were collected from faculty, staff, and graduate students in the EE department. Faculty, staff, and graduate students in the EE department were recruited through an email distributed by a departmental gatekeeper. Data in this study represent a convenience (i.e., nonprobability) sample because participants were selected based on availability and access to the EE department [8]. In total, 39 faculty members, staff and graduate students participated in the study, resulting in a 56.5% response rate. The Institutional Review Board approved all research protocols (#18-959).

Data were analyzed using descriptive statistics for Likert-type questions. Open ended questions were analyzed using thematic analysis [9]. We used Microsoft Excel to process all the data, including the different graphics showing the responses grouped by preference, and the quantification of the open-ended responses after they were grouped by themes.

Limitations

A major limitation of our study is the sample of a single department at a single institution. We recognize that our sample is limited, as many engineering education researchers and practitioners are located at a host of institutions in a variety of departments. Furthermore, this sample does not include international members of the engineering education community. Our sample is not representative of the institutional population, nor of the field, and therefore we do not aim to generalize across departments or institutions. Because several items on our instrument were similarly worded, it is conceivable that survey fatigue could influence our results [10]. Lastly, some of our items may prime participants to answer in a socially desirable way [10]. For instance, our instrument asks about decision making for conference attendance, and there may be a tendency to avoid discussion of funding limitations. Therefore, we acknowledge a participant tendency towards social desirability in responses as a key limitation of our survey research. Nevertheless, our results provide us with a better understanding of how one department approach conference participation and they can help us (i) better understand our needs to diversify as a department, and (ii) start a conversation in the field by expanding this research to other departments and to include engineering education researchers beyond our institution.

Results

Where Do We Meet? Conference Attendance Patterns

Several key patterns emerged across the overall survey response on conference familiarity. Across the responses, most of the participants focused on the 5 most common conferences which they regularly attend or have at least attended once. The familiarity pattern of conferences are shown in Figure 2 amongst which the most familiar responses include (1) American Society of Engineering Education (ASEE), (2) Frontiers in Education (FIE), (3) the American Educational Research Association (AERA), (4) the Collaborative Network for Engineering and Computing Diversity (CoNECD) and (5) Research in Engineering Education Symposium (REES). Interestingly, according to the survey response, ASEE conference was attended by all the participants at least once. The pattern also reveals the least familiar conferences for the participants includes: Engineering Education for Sustainable Development (EESD), Engineering, Social Justice and Peace (ESJP), Engineers for a Sustainable World Annual Conference (ESW), How to Engineer Engineering Education and Integrated STEM Education Conference (ISEC).

Factors That Influence Conference Attendance

Figure 2 shows the overall pattern on important factors considered by the participants when making decisions regarding choosing a conference. Among the options provided in the survey, the most important factor was “Funding Available” for both Faculty/staff and graduate students which was selected by 37.9% of the participants as their 1st option

Familiarity on Conferences

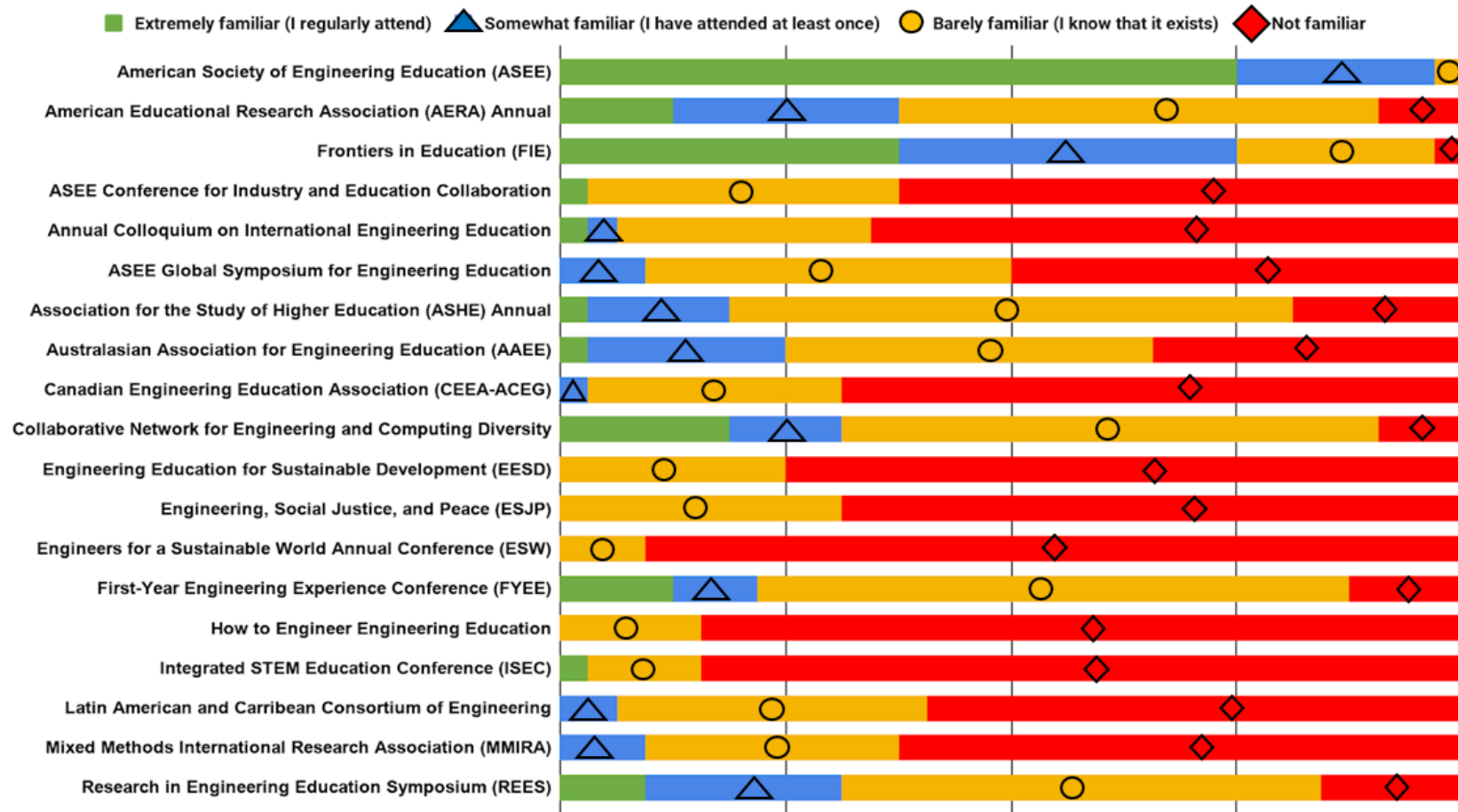


Figure 1: Familiarity with conferences - Overall pattern

Other factors provided were importance including “Quality of the conference” which was chosen as a 2nd option by 27.6% of the participants and the “Location” being a 2nd choice for 24.1% of the participants. In addition to the factors mentioned above, three faculty members expressed that the most important factor when deciding which conference to attend was when the people (peers) choose to attend the same conference they are attending. This factor is important as they believe that attending such conferences will strengthen relationships and purposefully connect with peers in the research community. In Figure 2 we provide detailed information of our results in terms of the reasons that faculty and graduate students ranked as more important when making decisions to attend a conference.

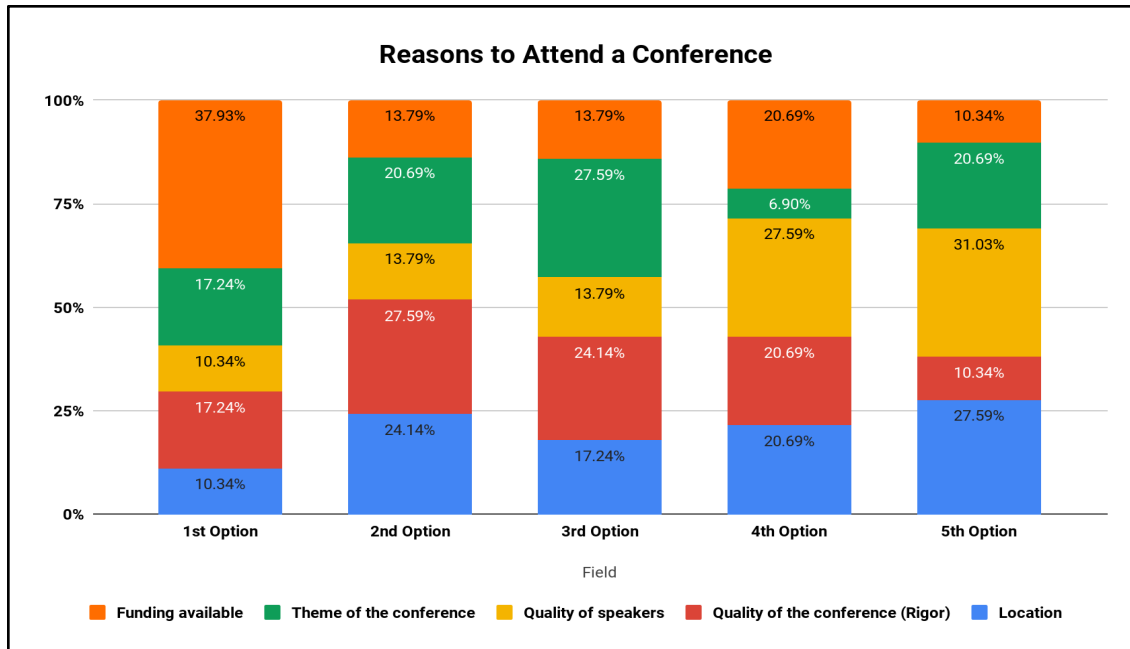


Figure 2: Overall Pattern on Important Factors that Influence Conference Attendance

Comparison Across Stakeholders

We also analyzed the comparison of faculty/staff participants and graduate student participants for conference attendance patterns and factors that influence attendance. Figures 3 and 4 show the pattern on conference familiarity by faculty/staff and graduate students separately. Overall, the pattern shows that faculty/staff are more familiar with conferences in the engineering education community in comparison to graduate students. Specifically, graduate students have mentioned only 8 conferences out of the 19 conferences listed as either “Extremely familiar” or “Somewhat familiar”. The most common conferences among the 19 conferences which both faculty/staff and graduate students have mentioned were ASEE and FIE.

Factors Important for Conference Decisions: Comparison of Faculty/Staff and Graduate Students

A comparison analysis of faculty/staff and graduate students on the important factors to attend a conference was carried out. Figure 5 shows the response pattern on the 5 factors for faculty/staff and graduate students.

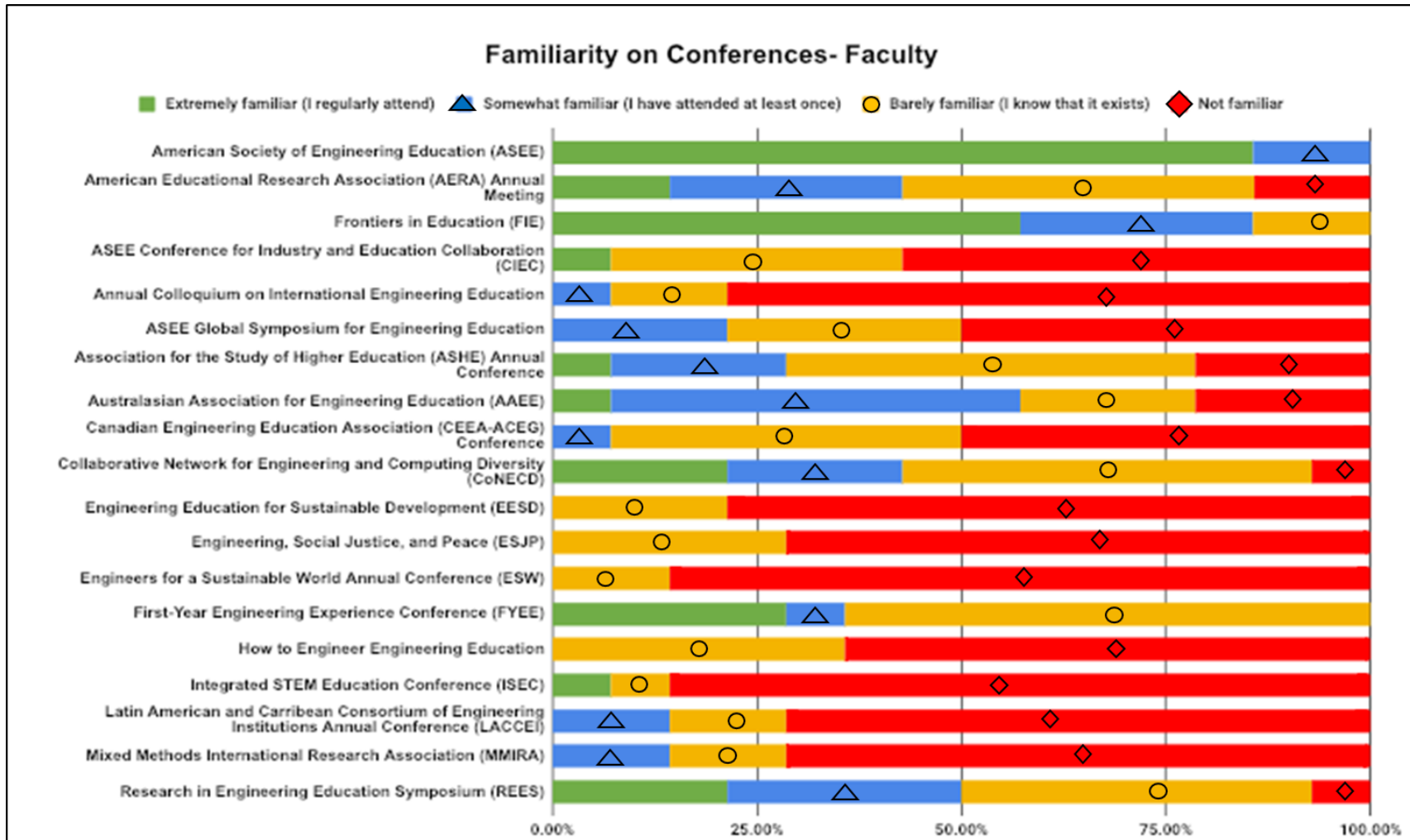


Figure 3: Familiarity on Conferences Pattern- By Faculty

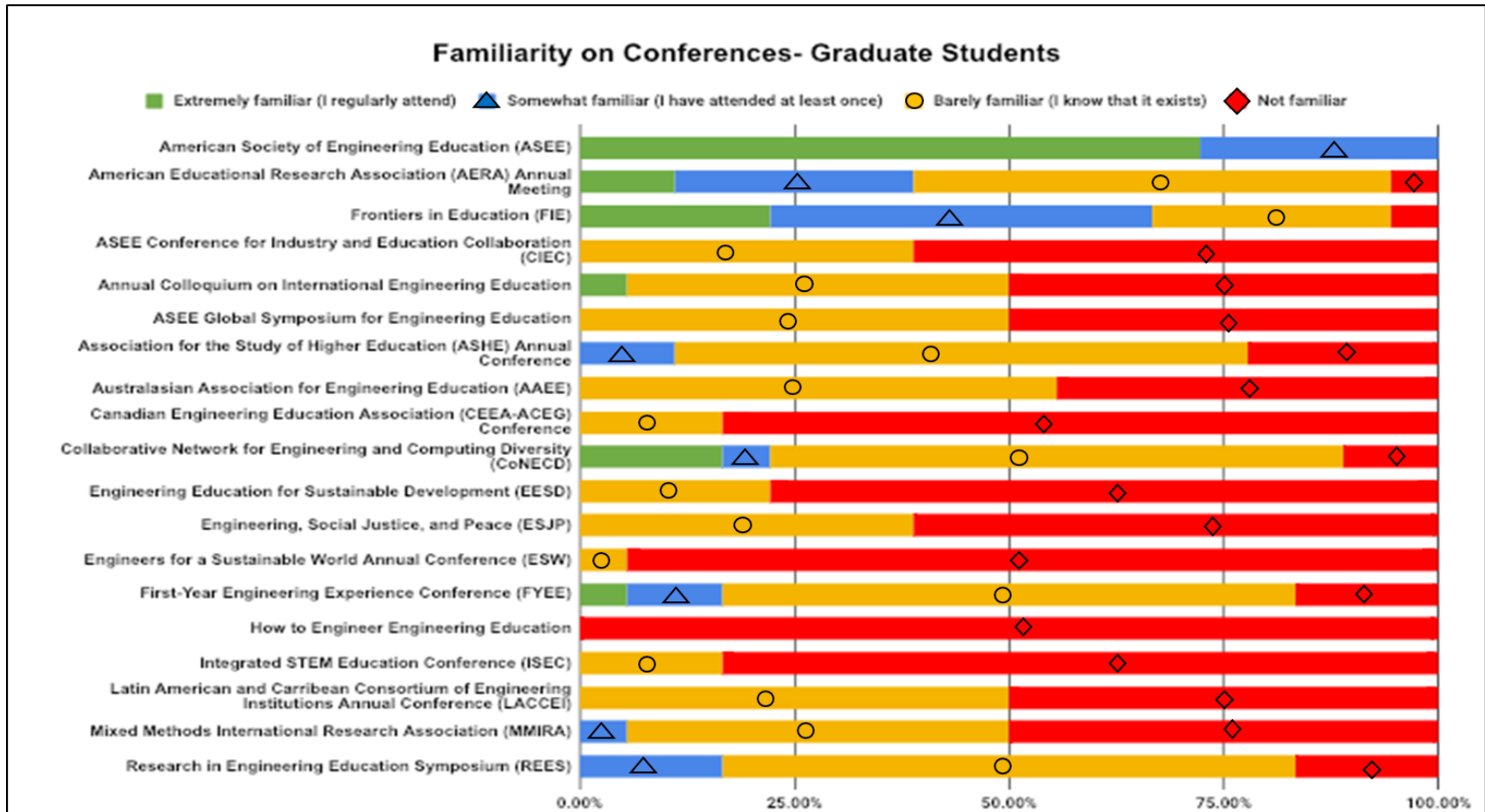


Figure 4: Familiarity on Conferences Pattern- By Graduate Students

Graduate students have mentioned “Funding available” and “Location” as their top 2 options when deciding on attending a conference while faculty/staff have responded to “Funding Available” and “Quality of conference” as their top 2 options. Interestingly, the 1st option for both faculty/staff and graduate students was the funding availability factor. The “Theme of the conference” was also a major factor chosen for faculty/staff but not for graduate students, we believe the reason is because faculty member already know their research space, but graduate students are exploring different options. Also, the “Quality of the speakers” factor was not a priority for neither faculty/staff or graduate students.

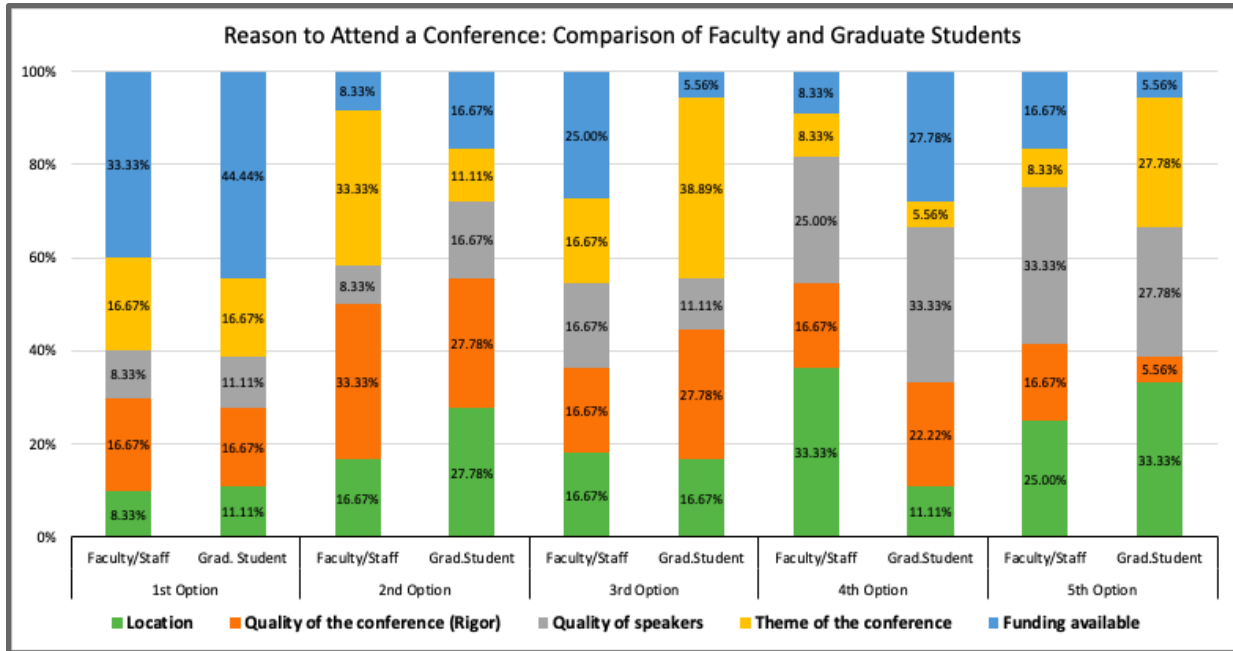


Figure 5: Comparison of Faculty/Staff and Graduate Students on the Reasons to Attend a Conference

Conference attendance response beyond the list of mentioned conferences in our survey.

A total of 8 other conferences were reported in the ‘other’ section of the survey response which participants have mentioned about attending. Table 3 highlights the themes of different conferences which participants have attended beyond the conference list in the survey. The conferences were listed in 4 different fields including Higher Education, Engineering Education, Technical and Interdisciplinary.

Table 3: Other Conferences Mentioned beyond the Survey

Conference Theme	Name
Higher Education	Association of American Colleges & Universities (AAC&U) Annual Meeting
	Labor and Employment Law Advanced Symposium
Engineering Education	European Society for Engineering Education Annual Conference (SEFI)
	South African Society for Engineering Education Conference
Technical	Broadening Participation in Data Mining
	IEEE International Conference on Informatics, Electronics and Vision
Interdisciplinary	American Association for the Advancement of Science (AAAS)
	Design Thinking Research Symposium (DTRS)

Discussion

This paper presents information to better understand conference participation in an engineering education department at research institution. We identified the conferences that faculty/staff and graduate students in the department are most familiar with and they typically attend. Against our initial perceptions, it seems like despite the different backgrounds of people in the department, they tend to attend the same conferences which happen to be the most popular in our field (i.e. ASEE, FIE, etc.). We believe part of the reason is the need to focus share our research in a place where people understand what engineering education is about. Another important factor is the people attending (peers) as it is implied that people attend the conference to meet with their long-term peers in the field or to meet with potential collaborators. It seems like the quality of the speakers is irrelevant, rather people attend the conference for other purposes. For example, researchers go to ASEE because they need to be there, the focus is not who the speakers are - people make decisions to attend before knowing who the speakers are actually - but the people they can meet there.

Another aspect regarding familiarity and participation in conferences in the department was the lack of international awareness and participation. For example, the European Society for Engineering Education Annual Conference (SEFI) was not mentioned in the survey and only one participant mentioned it in the open ended section, and we consider this to be one of the most important international engineering education venues. Similarly, the Latin American and Caribbean Consortium for Engineering Institutions (LACCEI) considered one of the most important events in engineering education for Latin-America is not well known by participants. Furthermore, country specific engineering education conferences were not considered as familiar as we were expected despite several countries having well-established national conferences (e.g. Australia, Canada, South Africa).

Our results also suggest that for graduate students the location was the second most important factor after the funding available. We believe those two inter-relate as location can highly impact the cost of the conference. There is a clear message here that funding for graduate students is important so when advancing our field we need to consider how to better support graduate students beyond the support systems already in place (e.g. free registration for students).

Despite having different backgrounds it seems like we don't go to different conferences. This indicates a need to promote more diverse conferences since many engineering education students might find jobs in their engineering traditional departments or in other traditional disciplines. We feel like engineering education researchers should be exposed to other types of conferences so we can make our field even more interdisciplinary. One way we consider we can promote different conferences outside the traditional ones is by developing a website repository where people can have a database to understand the conferences happening around the world not only in engineering education but also in different related fields. However, it is important to find ways to provide funding for graduate students when promoting other conferences, if engineering education programs consider it important that students are exposed to different spaces to share their research, it has to come with financial support.

Future work

We consider that results from this study provided an initial understanding of conference participation in one engineering education department. We consider this work to be important and relevant, hence, we plan to conduct a sequential explanatory mixed methods study. We plan to expand our data collection in two ways, one by develop a qualitative inquiry, particularly on the decision making process to better understand the reasons people have to attend. Secondly, we plan to expand our sample size. We want to expand this data collection beyond a single institution. We want to include several engineering education departments but also we want to include people from non-traditional departments. We believe the national conference can be a great place to collect this data so we can capture a larger range of diverse participants. We also plan to expand this research outside the United States to better understand conference participation globally. Expanding our data collection could enable comparisons: between departments, between institutions, between institutional roles (faculty, grad student, staff, etc.). In addition, we want to explore the influence of the characteristics of the conferences (length running, size, impact-factor/reputation, cost, etc) in the decision making process of attending.

We also expect to keep analyzing this data over time, especially with the creation of new engineering education departments and programs around the world, to see how the trends in our results might change (or not).

References

- [1] M. Borrego and J. Bernhard, "The Emergence of Engineering Education Research as an Internationally Connected Field of Inquiry," *J. Eng. Educ.*, vol. 100, no. 1, pp. 14–47, Jan. 2011.
- [2] B. K. Jesiek, L. K. Newswander, and M. Borrego, "Engineering Education Research: Discipline, Community, or Field?," *J. Eng. Educ.*, vol. 98, no. 1, pp. 39–52, Jan. 2009.
- [3] K. Beddoes, "Methodology discourses as boundary work in the construction of engineering education," *Soc. Stud. Sci.*, vol. 44, no. 2, pp. 293–312, 2014.
- [4] Borrego M, "Development of engineering education as a rigorous discipline: A study of the publication patterns of four coalitions." *Journal of Engineering Education* 96(1): 5–18, 2007

- [5] Fitzpatrick, J.L., J.R. Sanders, and B.R. Worthen, *Chapter 1*, in *Program Evaluation : Alternate Approaches and Practical Guidelines*. 2012, Pearson: Boston.
- [6] Felder, R.M. and R. Brent, *Designing and teaching courses to satisfy the ABET engineering criteria*. *Journal of Engineering Education*, 2003. 92(1): p. 7-25.
- [7] R. A. Singleton and B. C. Straits, "Chapter 9: Survey Research," in *Approaches to Social Research*, New York, New York: Oxford University Press, 2010, pp. 263–305.
- [8] E. R. Babbie, *Survey Research Methods, Second Edition*, 2 edition. Belmont, Calif: Cengage Learning, 1990.
- [9] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qual. Res. Psychol.*, vol. 3, no. 2, pp. 77–101, 2006.
- [10] N. Bradburn, "Response Effects," in *Handbook of Survey Research*, Academic Press, Inc., 1985.

Appendix I: Survey Instrument

Please rate how familiar you are with the following conferences:

	Extremely familiar (I regularly attend)	Somewhat familiar (I have attended at least once)	Barely familiar (I know that it exists)	Not familiar
American Society of Engineering Education (ASEE)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
American Educational Research Association (AERA) Annual Meeting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frontiers in Education (FIE)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASEE Conference for Industry and Education Collaboration (CIEC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Annual Colloquium on International Engineering Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ASEE Global Symposium for Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Education

Association
for the Study
of Higher
Education
(ASHE)
Annual
Conference



Australasian
Association
for
Engineering
Education
(AAEE)



Canadian
Engineering
Education
Association
(CEEA-
ACEG)
Conference



Collaborativ
e Network
for
Engineering
and
Computing
Diversity
(CoNECD)



Engineering
Education
for
Sustainable
Developmen
t (EESD)



Engineering, Social Justice, and Peace (ESJP)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engineers for a Sustainable World Annual Conference (ESW)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
First-Year Engineering Experience Conference (FYEE)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How to Engineer Engineering Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrated STEM Education Conference (ISEC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Latin American and Caribbean Consortium of Engineering Institutions Annual Conference (LACCEI)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Mixed Methods International Research Association (MMIRA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research in Engineering Education Symposium (REES)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please provide the name(s) of any other(s) conference(s) that were not listed before and you have attended:

Please select what factors are most important to you when making decisions on what conference to attend

- 1. Location
- 2. Quality of the conference (Rigor)
- 3. Quality of speakers
- 4. Theme of the conference
- 5. Funding available
- 6. Other:

What is your role?

- Faculty/Staff member
- Graduate student