

## **Forming Key Partnerships to Enhance Graduate Student Programming**

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Emily Hart is the Science and Engineering Librarian at Syracuse University. She is a liaison librarian serving 10 STEM related departments, including the College of Engineering & Computer Science. Emily completed her B.A. in English with a minor in Education at St. Bonaventure University, and her M.L.S. and an Advanced Certificate in Educational Technology at the University at Buffalo. Emily has specialized in supporting science research for over 10 years. She is an active member of the American Society for Engineering Education. She has presented at local and national conferences, most recently on topics related to assessment and STEM graduate programming and outreach. Her research interests include assessment, scholarly communications, graduate student outreach, instruction, and emerging technologies.

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Alex Jannini is a fourth-year PhD student at Syracuse University in the Biomedical and Chemical Engineering Department. His current research consists of developing tough and elastic double network hydrogels that have adhesive, self-healing, and biomimetic properties. His Master's research focused on implementing pharmaceutical engineering concepts into lab-based, introductory engineering courses. He has had experience in the classroom as an adjunct professor at Rowan University. In this role, he helped develop a series of experiments for a freshman engineering course that explored introductory engineering concepts through chocolate manufacturing, and another series of experiments involving dissolvable thin films for a similar course. Alex is also the president of the Syracuse University Chapter of ASEE, and has been working diligently with his executive board to provide seminars and workshops for their fellow graduate students. Alex's plans upon graduation involve becoming a professor or lecturer, specifically at a primarily undergraduate institution.

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# **Forming Key Partnerships to Enhance Graduate Student Programming**

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## **Abstract**

The graduate chapter of the American Society for Engineering Education (ASEE@SU) and the STEM Librarian at Syracuse University formed a collaborative and mutually beneficial partnership with the goal of enhancing non-curricular educational opportunities for graduate students in the College of Engineering and Computer Science (ECS). By combining the expertise of both organizations, including strategies for event planning, marketing, and outreach, as well as data garnered through event feedback surveys, significant strides were made toward connecting with and better understanding the needs of ECS graduate students. The goal of this study is to share lessons learned and recommendations for developing successful graduate programming initiatives through collaboration.

## **Introduction and Background**

Connecting with graduate students in the College of Engineering and Computer Science (ECS) and developing methods for providing educational and professional development opportunities is challenging due to the non-uniform and individually-tailored nature of graduate study.

The Libraries provide an array of resources, such as specialized databases and research support services to graduate students, aiding them in their studies, research, and career-building endeavors. It is the mission of the Libraries to engage with students through outreach events and programs to increase student awareness of library resources, with the primary goal of fostering academic success and lifelong learning. [1] At Syracuse University, approximately 25% of the graduate students are STEM majors, making it a high priority for the STEM Librarian to find new and effective avenues for connecting with them. However, attempts to connect graduate students to these resources have been hindered by a lack of understanding for how to reach and communicate with graduate students, an absence of regularized funding to host events, and insufficient data regarding graduate students professional development needs and interests. The STEM Librarian's traditional interactions with graduate students include orientation sessions, curricular-based information literacy classes, and faculty research group meetings, which misses many students. For those students who do connect with the STEM Librarian in the aforementioned sessions and meetings, the knowledge gained is often fleeting, as it is not being presented at the point of need.

In order to find additional avenues for reaching ECS graduate students, the STEM Librarian recognized the need to develop non-curricular educational programming for these students. Early in the process, the STEM Librarian began seeking partnerships with graduate student organizations, including ASEE, in hopes of leveraging their expertise in areas like event planning and marketing and finding external funding to incentivize event attendance. Choosing appropriate educational topics was also challenging due to the disparate requirements of graduate programs in ECS, from non-thesis based Master's programs in Computer Science to doctoral programs in Biomedical Engineering. Garnering insights from graduate students about desired

topics was also needed to ensure that workshops would be relevant while still maintaining a wide appeal across ECS graduate programs.

The student chapter of the American Society for Engineering Education at Syracuse University is an organization that is committed to improving and furthering engineering education. The mission of ASEE@SU is to “encourage engineering students, including underrepresented groups such as women and minorities, to seek advanced degrees and academic careers in engineering; to aid graduate engineering students in preparing to seek employment in academia; and to increase pedagogical understanding and best practices in engineering education” [2]. The similarities between the missions of the Libraries and ASEE@SU, both of whom pledge to aid students in achieving success in their academic careers and beyond, and the desire to find the most successful avenues for connecting with graduate students helped to foster a mutually beneficial relationship. ASEE@SU puts on programming throughout each academic year, mainly in the form of workshops and seminars designed to sharpen ECS graduate student’s soft skills. Their core programming, however, is the annual Soft Skills Boot Camp, also known as the Mini Retreat, which typically spans 3 days and focuses on professional development techniques such as time management, networking skills, and career readiness. In order to improve their programming efforts, ASEE@SU sought expertise from outside of the college, which was a difficulty for the committee.

Independently, both organizations have historically provided outreach and programming to graduate students. Through the development of non-curricular educational programming, each organization hopes to create and define new paths for ECS graduate students to connect to the resources, services, and skills they’ll need to succeed in their programs and future careers. The partnership between ASEE@SU and the STEM Librarian ultimately seeks to collaboratively address and remedy the limitations each organization experiences in providing graduate student programming on its own. To better connect with graduate students in ECS, a collaborative relationship formed between the STEM Librarian at Syracuse University Libraries and the executive board of ASEE@SU. This paper discusses the challenges faced by each organization, presents results from professional development events for graduate students, and provides details on successes and benefits gained through this collaborative relationship.

## **Literature Review**

The literature shows that there is often a clear disconnect between graduate students’ skill levels in research and professionalism and faculty members’ perceptions of the skills and level of preparedness that students enter a graduate program with [3-5]. In a study by Rempel and Davidson, they note that “Faculty advisors assume that graduate students arrive competent in research skills, or that students discover how to carry out research on their own through self-discovery” [3]. In a survey of engineering graduate students’ perceptions of ‘initial research skill preparedness’, Rogers and Goktas found that students felt they were not prepared to do research upon entering their programs and that their preparedness did not improve after their first year of graduate study [4]. In their surveys, Rogers and Goktas asked about graduate skill proficiency in areas like research organization, communication, statistical analysis, and conducting experiments, which engineering graduate students recognized as valuable, while faculty disclosed that they placed more emphasis on publication output than skill development. In

addition to showing a need for greater emphasis on research skill development, Rogers and Goktas' study points to a need for engineering graduate students to further develop their 'soft skills' [4]. Similar to professional skills, the term 'soft skills,' as referenced by Moss and Tilly, refers to the "skills, abilities, and traits that pertain to personality, attitude and behavior rather than to formal or technical knowledge" [6].

Aside from a lack of confidence in and education around research and professional skills, the literature shows that graduate students' awareness of and level of exposure to key university resources varies widely. Bussell et al. and Hoffman et al. observed that graduate students are often unaware of the resources and services available to them, unsure of how and where to access them, and may not recognize the potential impact these resources could have on their academic and professional careers [5] [7]. This may be in part due to graduate students' diverse levels of prior exposure to resources (particularly international students), causing a general lack of awareness about available resources [8] [9]. In a survey of doctoral and post-doctoral students, Tomaszewski found that of 132 participants who were "asked to select the name of their science librarian, 70 percent or 91 participants indicated that they 'don't know'" [8]. This study exemplifies the magnitude of the problem of graduate students' lack of awareness about available resources and services, and the need to find new avenues for supporting skill development and connectedness to university resources.

Due to the disparate and non-uniform nature of graduate study, workshops and events are a common option for connecting with graduate students. The literature overwhelmingly shows that libraries and organizations doing outreach to and providing programming for graduate students face numerous challenges [5] [7] [8] [10] [11]. One reason noted for failed or ineffective attempts include graduate students taking fewer courses than undergraduates, thus providing fewer curricular based, structured opportunities to connect [7]. Consequently, librarians have less course-related face time with graduate students than with undergraduate students, heightening the need for external programming. Bussell et al. found it difficult to plan workshops that would appeal to both PhD and Master's-level graduate students across different types of programs. They note that "a doctoral student who is preparing for a career in academia will likely have different experiences and needs than a student in a professional master's program when it comes to developing their research skills and agenda" [5].

Data specific to engineering graduate students was less prevalent, so the literature looks more broadly at graduate programming beyond STEM. Researchers indicated that connecting with graduate students and marketing events was key to improving attendance and the overall success of non-curricular based programs. Peacemaker and Roseberry noted that the success of their graduate workshops suffered as a result of poor attendance. After changing tactics and focusing more heavily on the promotion and advertisement of their events while also establishing new campus partnerships to help reach a wider audience, event attendance greatly increased [10]. Critz et al. found that establishing a partnership with a graduate student group was particularly beneficial because of opportunities to co-promote and co-sponsor events [11]. Workshop timing is also critical to the success of graduate programming. Hoffman et al. collected data on preferred workshop format and time of day, and their results showed that in-person workshops with online documentation to refer to after was desirable. They noted that there was no clear

preference for the time of day to host workshops or the length of time for workshops; responses varied from a recommended time of 30 minutes to preferring a full day workshop [7].

The literature also showed that selecting topics that appeal to a wide audience across graduate degree programs is key to workshop attendance. [5] Baruzzi and Calcagno surveyed librarians about the types of interactions they have with graduate students and the program topics they provide. “Only a small percentage of respondents offer workshops about the publication process and topics in scholarly communications”, instead holding more traditional workshops focused on topics such as literature searching [9]. However, results indicate that graduate students respond well to topics that align with their program of study, and desire “professional skills” workshops including topics on publishing, grant writing, and presentation skills [9]. The results of Hoffman et al. and Lalwani et al. were similar, showing that students had greater interest in topics related to the publication process including workshops on data management tools, citation management software, strategies for keeping current with scholarly literature, and finding funding opportunities [7] [12].

## **Methods**

Both ASEE@SU and the Libraries developed individual and jointly planned workshops intended to introduce ECS graduate students to academic resources on campus. ASEE@SU holds one-off workshops throughout the academic year; however, the primary focus of our study is to investigate the impacts of skill development on graduate students through ASEE@SU’s primary event, the 3-day Soft Skills Boot Camp (also referred to as the Mini Retreat) in May, and the jointly funded Research Speed Dating and Research Roundtable event series led by the STEM Librarian and the Libraries. The Soft Skills Boot Camp events focus on bringing in guest faculty and staff from different departments on campus, including Syracuse University Libraries, to help graduate students build soft skills and network with key individuals from within ECS and across campus. The Research Speed Dating and Research Roundtable events were planned jointly, relying on funding, communication strategies, and topical data from both organizations. The events were designed to introduce graduate students to the libraries resources and services, and topics applicable to research and publishing. Analysis of the data from these events has helped both organizations find new insights and methods for developing future graduate programming.

### ***Structure of ASEE Boot Camps***

Prior to the two ASEE@SU Mini Retreats in 2017 and 2018, surveys were sent to E-mail listservs for graduate students, which includes approximately 1000 students, and faculty in the College of Engineering and Computer Science. These surveys were intended to gauge interest on the skills that should be covered as well as desired timing of events. A benefit of our collaborative partnership included the STEM Librarian lending assessment expertise to improve upon the 2018 Mini Retreat pre- post survey design and wording, prior to the surveys being disseminated. All surveys used a Likert scale for rating responses; the structure of the ratings is further described in the results section. Based on survey responses from students and faculty, topics with the highest ratings were chosen for the two Boot Camps. The timing of events—total number of days for the Boot Camps and the time of day for the events—were also chosen based on responses from the surveys. The responses are described in detail in the results section. The pre- and post-surveys are included as Appendix A.1 and Appendix A.2.

For the 2017 Soft Skills Boot Camp, three consecutive days (May 23-25) were chosen, with events held on half-day (4 hours maximum) schedules. For the first two days, the event ran in the morning (9:00 A.M. to 11:30 A.M.) while on the last day, the event ran in the afternoon (1:00 P.M. to 5:00 P.M.). Students were required to register for the event at least two weeks in advance so the correct amount of food could be ordered from campus catering. All participants were given two meals on each day: breakfast and lunch on the first two days, and lunch and dinner on the third day. All funding for the Boot Camp was provided by the Graduate Student Organization (GSO). ASEE@SU is a non-departmental student organization registered through the GSO. Annually, our non-departmental student organization is given a small amount of funding to provide programming for on-campus graduate students. Several times throughout the year, graduate student organizations can submit a proposal to the GSO to receive additional funding for programming initiatives, called special programming funds. Most of the money received to pay for the Soft Skills Boot Camp comes from special programming funds.

The schedule for the 2017 Mini Retreat is shown in Appendix A.3. The morning sessions started with breakfast and insightful conversations with the deans in the College of Engineering and Computer Science, and the skill development workshops were held afterward. On the first day, workshops were led by faculty in the School of Communications on communicating science and engineering to non-technical audiences, and by the STEM Librarian on managing citations using the citation management software Mendeley. On the second day, there were workshops on visualizing data and on writing abstracts; staff from the Writing Center assisted workshop participants on revising and editing research abstracts. The third day included a pitch competition where participants gave 3 minute presentations which described their research to a non-technical audience, followed by a networking social with faculty and students, which wrapped up the events.

The schedule for the 2018 Soft Skills Boot Camp was changed based on the feedback collected on timing of events at the end of the 2017 retreat. In 2018, each day of the retreat was held on a separate week on the following days: May 9, May 16, and May 23. Events were held on half-day schedules from 8:30 A.M. to 12:30 P.M for the first two days and from 11:00 A.M. to 4:30 P.M on the final day. Registration was also required, but students were given the option to register for specific days of the retreat to offer flexibility in scheduling. Two meals were again provided on each day through campus catering.

Appendix A.4 shows the schedule of events for the 2018 retreat. The first two days began with discussions with deans from ECS, followed by the soft skill development workshops—similar to the 2017 retreat. The first day included the visualizing data presentation that was held the previous year, followed by a workshop on time management. The second day included a workshop by the STEM Librarian on developing an online research profile through various networking and social media platforms in addition to a career panel. The final day included the research pitch competition, a workshop on diversity and inclusion by an outside speaker, and a networking social to finalize the retreat. At the end of both retreats, feedback was requested in order to improve the structure of the retreat.

### *Structure of \_\_ Libraries' Research Speed Dating and Research Roundtable Event Series*

SU Libraries, ASEE@SU and the ECS GSO co-funded and hosted a series of events for graduate students focused on increasing awareness of key resources and services offered through the libraries to graduate students. Funding was provided by both graduate student organizations using their GSO funds, and the Libraries. The events were offered in a casual environment and were designed to increase face-to-face interactions among participants and librarians. The roundtable events were held at the Inn Complete, a frequent graduate student hangout location off-campus that serves food and alcoholic beverages, and provides discounted prices to SU graduate students. The events were held on Thursday evenings prior to trivia night at the Inn Complete, which traditionally draws large crowds of graduate students. The slogan for the libraries' events was "Come to learn, stay for trivia". Registration was required for all participants, and participants were asked to detail what they were most interested in learning; this ensured that the events remained relevant to as many students as possible. At each event, food was provided by campus catering, along with one free drink ticket for each participant, which further incentivized attendance.

To market the events, emails were sent to graduate students via the ECS graduate student listserv, the main GSO listserv, the Graduate Programs Office, and to some individual college and department listservs via the subject librarians. Details including the event description and registration forms with survey questions were posted on the Libraries' website via the news feed and on the Libraries' social media accounts. Although the events were marketed more heavily to STEM students because they were co-organized by the STEM Librarian, ASEE@SU, and the ECS-GSO, all graduate students were invited to attend.

The first event, Speed Dating the Research Experts, took place on February 1, 2018. It was designed to be the kick-off event for a series of follow-up research roundtables that were smaller and took a deeper dive into specific topics. The Research Speed Dating event, as the name implies, followed a speed dating-style format. In order to facilitate the rotation of a large group over the span of 2 hours, participants were assigned to small groups of around 5 people, with each group having 7 minutes to meet with an individual from the Libraries who specialized in a specific topic: starting a research project, data services and tools, author's rights and open access, research impact, SU's institutional repository for dissertation and thesis submission, and funding opportunities. The speed dating event was designed to expose students to a large group of librarians, including the Open Access & Copyright Librarian and the Data Librarian whom they may not normally come in contact with, who could serve as points of contact throughout their graduate careers. ASEE@SU, ECS GSO, and SU Libraries each had an information table set up at the event to provide additional opportunities for students to ask questions during their scheduled 7 minute "break." Feedback surveys were collected from participants at the end of the event as seen in Appendix B.1

The next events in the follow-up research roundtable series took place on March 8 and March 22 and were structured as seminars focused on providing greater insight into the specific resources the Libraries could provide. The first roundtable covered an in-depth explanation of resources for starting a research project in different subject areas, resources for accessing databases and journals, and resources for citations and citation management. The second roundtable covered explanations and demonstrations of resources relevant to determining an appropriate journal to

publish in, data collection and processing tools, and publishing and copyright services and support through the Libraries. Presenters at the first two roundtables were primarily subject librarians and the Data Librarian, who offered insights on different topics and resources from a variety of disciplinary perspectives. The final event focused on career resources and services. The Business & Entrepreneurship Librarian, Open Access & Copyright Librarian, and STEM Librarian presented with the Director of Graduate Career Services on topics including finding detailed company information, how copyright and open access could positively affect research reputation, and grant funding resources. This event fostered a new relationship between the Libraries and Graduate Career Services which has led to future event collaborations. Surveys were provided at the end of these events to solicit feedback. The general survey can be seen in Appendix B.2.

## **Results and Discussion**

Data collected from surveys and registration forms before and after the Soft Skills Boot Camp and the Libraries' Research Speed Dating and Research Roundtable event series provides insights for improving upon future outreach efforts to graduate students.

### ***Student Interest and Availability***

Student responses determining the topics of interest, the time of day, and amount of time per day that students were willing to commit were collected by ASEE@SU in the years 2017 and 2018. For topics of interest, students were asked to rate their willingness to attend a workshop that covered a specific topic on a Likert scale from 1 to 5; a response of "1" corresponded to "I would not attend" while a response of "5" corresponded to "highly interested." The students were asked to choose from one of four choices for both the time of day and duration. For the time of day portion, students could choose from "Morning", "Afternoon", "Evening (After 5:00 PM)", and "No Preference." For duration, students could choose from "An hour", "A few hours (2 to 3 hours)", "A half-day (4 to 6 hours)", and "A full day (7 to 9 hours)." The surveys for 2017 and 2018 can be seen in Appendix A.1 and A.2, respectively.

The responses from the topics of interest portion are shown in Figure 1. As noted in the figure, 2017 and 2018 had a differing number of respondents (30 and 36, respectively). From 2017 to 2018, certain topics were added or taken away from the list, which is why data for certain topics only have data for one year. The addition or subtraction of certain topics was due to the availability of hosts and experts, the experiences and difficulties of the executive committee trying to put together certain workshops, and also the desires of the executive committee. From year to year, student interest remains mostly constant. Only slight differences could be seen in two topics: an increase for "Mentoring an Undergrad" and a decrease for "Ins and Outs of Publications." Overall, student interest was high for each topic, with an average response for each topic at 3 or above. In addition to this, students were also given an open-ended prompt to state any additional topics that they would be interested in. Most of these responses provided no additional topics. Some selected responses regarding topics were as follows: "Grant and Scholarship searches and preparation."; "maybe related to job seeking."

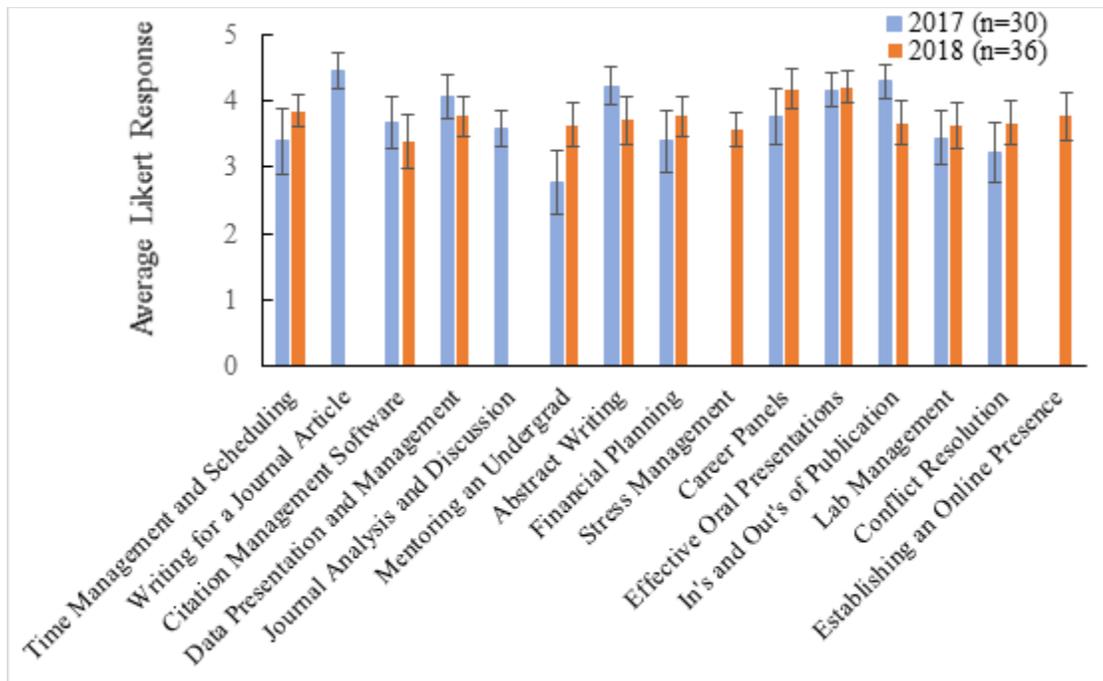


Figure 1. The results of two topic interest surveys given to graduate students by ASEE@SU. The error bars are 95% confidence intervals. Lack of a bar for a specific topic means that it was not included in the survey for that specific year.

Similar results were observed from the Libraries' surveys. In a post-event feedback survey regarding graduate students' interest for future research roundtable events, a majority of students were interested in data management and software and research-based topics such as securing funding. The percent of interested students for each topic can be seen in Figure 2. The graduate student survey results of Lalwani, et al. [12] showed similar results to those of SU Libraries, with students showing a high interest in having workshops on data collection software, data management tools, and citation management software (clumped together as "Data tools & services" in Figure 2), and finding funding opportunities.

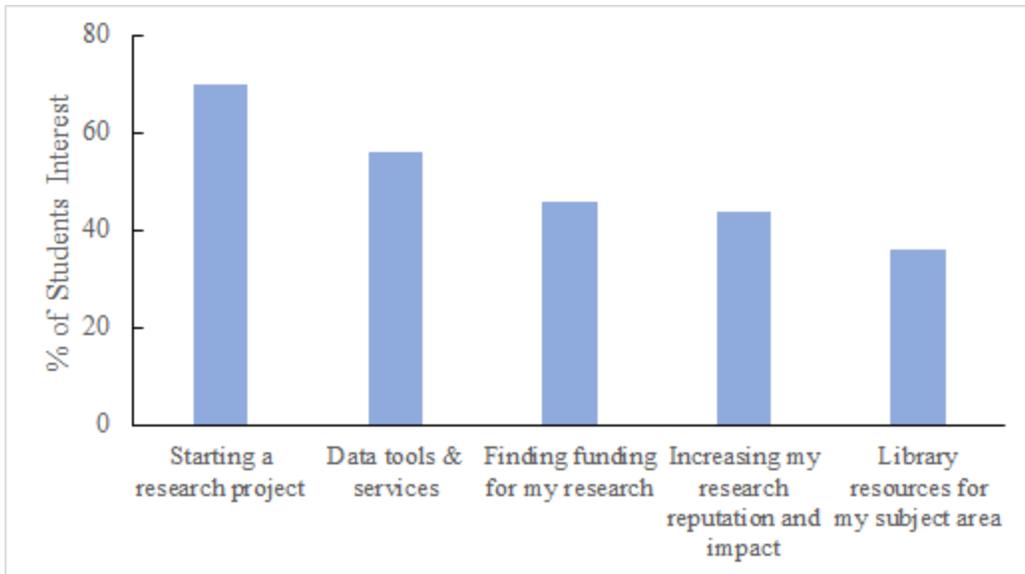


Figure 2. The percent of students interested in workshop topics proposed by the library. Data was collected during the Research Speed Dating event.

The results for questions regarding the time of day and duration of events in the surveys for the Mini Retreat are shown in Figures 3 and 4, respectively. While the results show little difference between attendees preferred timing for the workshops in 2017, in 2018 the data shows that students prefer having workshops in the evenings as opposed to mornings. The preference for evening workshops is corroborated by Hoffman et al.'s study [7]. This could be due to the timing of survey collection; the 2017 survey was sent out in Mid-March, while the 2018 survey was sent out Mid-January. The differences in preference could be a result of students considering their schedules for the spring semester in the 2018 data. This could also serve to explain the increase in preference for a one-hour workshop in the 'amount of time' data.

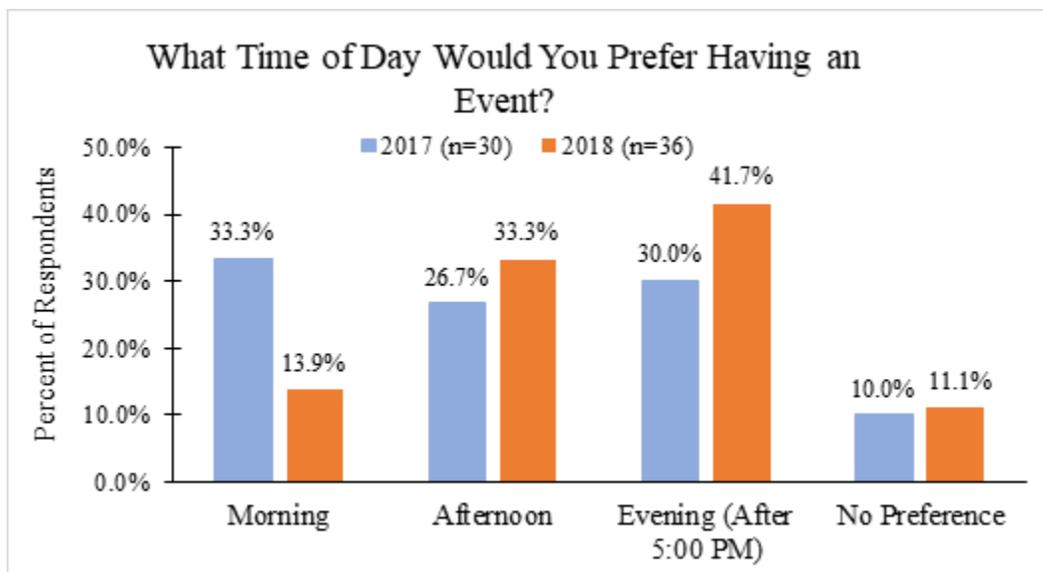


Figure 3. Student responses to the time of day question asked in the ASEE@SU survey.

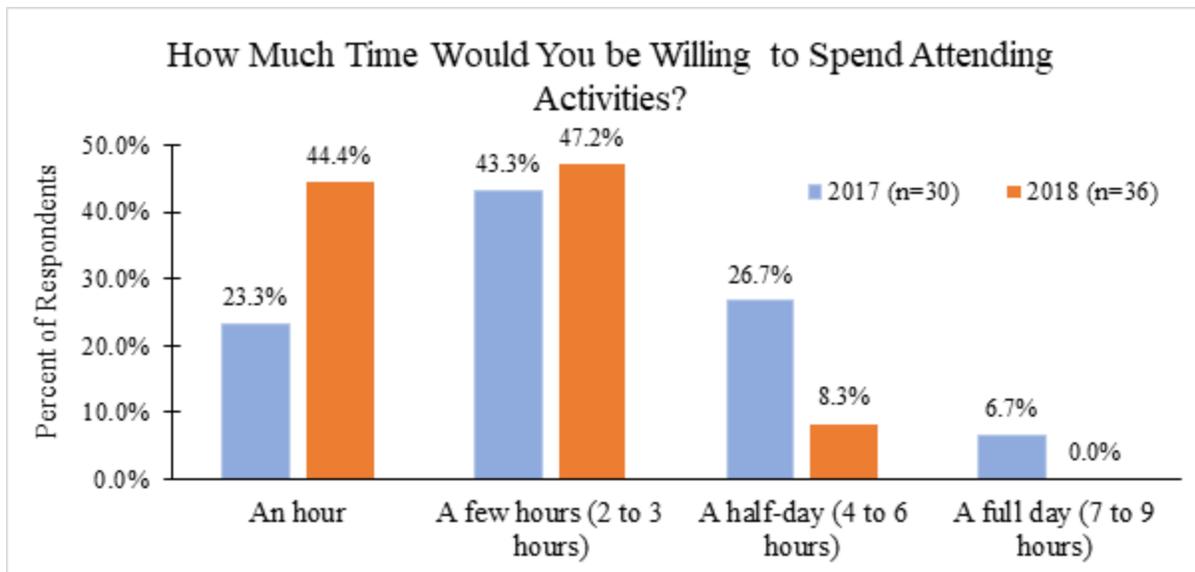


Figure 4. Student responses to the amount of time question asked in the ASEE@SU survey.

Data collected by the STEM Librarian confirmed the data shown in Figures 3 and 4. While data collected from the libraries' survey was mostly qualitative in nature, 72.3 % of responses to the Librarian Speed Dating Event gave positive feedback regarding the time of the event (weekday evening). It should be noted this survey was given to students early in the spring semester and was intended to gather data about student's availability for the rest of the semester. A data question that was also asked in this survey was whether or not the location was appropriate. The speed dating event was hosted at an off-campus location that was accessible via local buses used by a majority of students and faculty throughout the year. This venue is considered part of the university, and so it is accessible to student organizations for events, and has the benefit of cheaper catering costs as well as the ability to serve alcoholic beverages. Despite these benefits, student opinions were mixed in terms of the venue. About 36 % of the students complained that the venue was too far away from campus. One such response is as follows: "Maybe. It takes time to get to if you don't have a car. The bus takes forever! It is a good space but the presence of other people there made it tricky."

### ***Attendance***

Throughout the year, ASEE@SU saw varying attendance at events held during the fall and spring semester between 2017 and 2018. Attendance was not formally collected for events held throughout the academic year, but registration was collected for the Soft Skills Boot Camp events that were held in mid- to late-May of both years. There were 12 registered attendees for the special event in 2017 and 35 in 2018. However, the number of registrants in 2018 does not indicate that the event had 35 attendees the entire time. As this was a multi-day event, students could choose which days and the workshops on each day they wished to attend. Therefore, some had higher attendance than others.

From all the surveys, one issue with the data is the low amount of responses, and therefore low amount of attendance, in relation to the student population. From previous work, however [13], it should be noted that the attendance during the multi-day events saw over a 400% increase in

comparison to the events usually put on by ASSE@SU during the academic year. From experience, any attendance or registration that was counted in the double digits was considered to be high turnout. The library events were also well attended, with the average attendance being 18 students. It should be noted that library events were tailored to multiple colleges and school, while ASEE@SU specifically focuses on developing workshops for the engineering college.

### ***Feedback***

ASEE@SU also used a survey at the end of the Mini Retreat to determine the attitudes of attendees after the series of workshops and seminars. Students were asked to complete another survey in which they used a Likert scale response to indicate how much they agreed with a series of statements; a response of “1” meant “strongly disagree” and a response of “5” meant “strongly agree.” Due to the topics changing from year to year, only selected statements are used in this paper. It should also be noted that wording was changed from 2017 to 2018, with input from the STEM Librarian, to better reflect what was trying to be assessed. For comparison purposes, Table 3 uses a coded statement, and shows the exact wording that was used for both years. To see the entirety of the surveys for both 2017 and 2018, see Appendix C.1 and C.2.

Table 3. The coded statements used for comparisons, and the corresponding statements used in the 2017 and 2018 surveys.

Coded Statement	2017 Statement	2018 Statement
Soft Skills - Importance	Soft skills are an important aspect of graduate level education.	Soft skills, such as communication and time management, are important skills for grad students to learn.
Soft Skills - Proficiency	Being proficient in soft skills makes me a more desirable candidate for jobs, whether they are in academia, government, or industry.	Being proficient in soft skills makes me a more desirable candidate for jobs, whether they are in academia, government, or industry.
Workshop Attendance	Attending workshops and seminars is the best way to hone soft skills.	Using hands-on and interactive workshops is an effective method for learning soft skills.
Time Management	I have a good set of time management practices.	I know several different methods of time management.
Effective Visuals	I am able to create effective visuals to present my data.	I know how to make the most effective visuals for publications and posters.
Communicating Science	I am able to communicate my research goals and aims effectively.	I am confident in my ability to effectively discuss and communicate my research to a variety of audiences.

The responses to these surveys are shown in Figure 5. There was no discernable difference in students' attitudes after attending the workshops, however, there was a low survey response rate relative to the responses collected through registration and the pre-event interest survey. One method that could help boost the numbers of responses is to have the attendees complete the

survey at the immediate end of the workshop/special event, as opposed to electronically several days after. While all statements included in this work had an average response at or above 3, increases in the average response would be desirable for several topics, including “Effective Visuals” and “Communicating Science.” In addition, it would be positive to see a reduction in the variation of the responses for each of the topics.

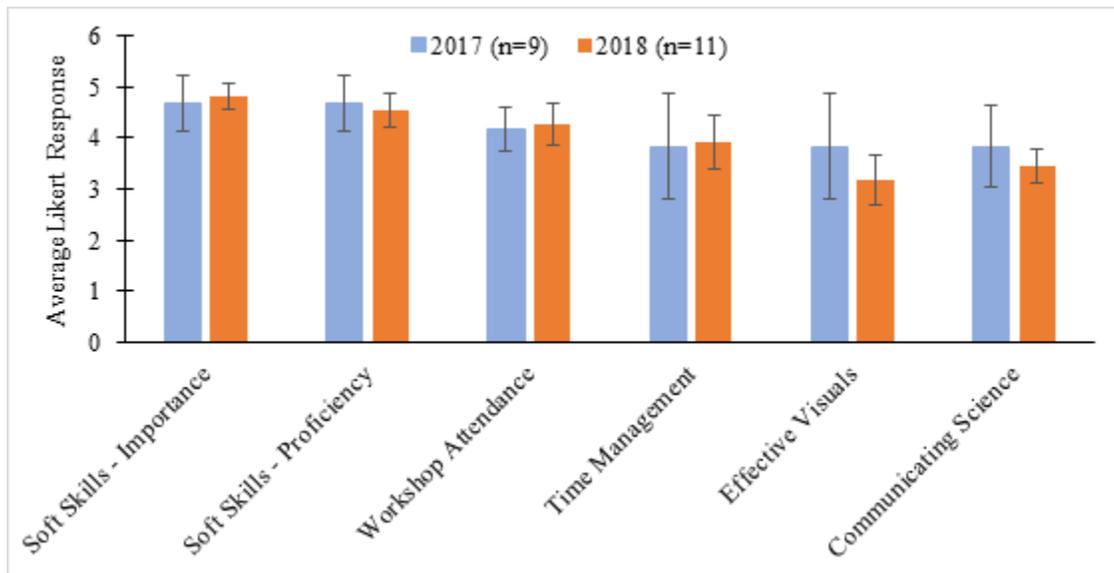


Figure 5. The average Likert response of students to statements regarding the importance and knowledge of soft skills. The error bars are 95% confidence intervals.

Library feedback surveys found that students had a high interest in attending future events. 53% of students responded that they would be interested in attending future events during the semester, while 23% said they would be willing to attend events during the summer. There was also a large amount of positive qualitative feedback. Some examples include the following: “I learned a lot from the sessions this semester. I’m glad we have them - they help navigate life outside the course bubbles we live in.”; “First, I came to know that such services are offered to students with no cost. I was not aware about this. Especially for the research students, that was an awesome opportunity. I would have missed a big part of university study if I did not participate in the program. I am really thankful to the organizer for such a very useful event.”

### ***Thoughts on Collaboration***

Prior to collaborating with ASEE@SU the STEM Librarian mainly participated in non-curricular graduate events as an invited speaker but had not taken the lead on graduate program development and event planning. The STEM Librarian lacked insights and connections with graduate student organizations deemed essential for marketing and planning events and funding to incentivize event attendance. The ASEE executive committee lacked the contacts necessary to put on the programming that they felt best for the graduate student body. The goals of both the student organization and the libraries are parallel in helping graduate students with soft skill development and educating them about the many resources and services available through the university.

The partnership between ASEE@SU and the STEM Librarian ultimately seeks to collaboratively address and remedy the limitations each organization experiences on its own. ASEE@SU has benefited from the partnership with the STEM Librarian who has fostered heightened awareness of and connections to campus resources. As the student chapter is a workshop-oriented organization, there is a need to be in contact with myriad of the university resources and offices, such as the Office of Research and Graduate Career Services, to leverage and pull in people with different skill sets from across campus. The STEM Librarian has also helped ASEE@SU refine survey instruments and gain more holistic insight into planning and assessment, which will undoubtedly benefit both organizations going forward.

SU Libraries has also gained from the partnership, as the student organization shared their data regarding student's interests as well as their preferences for workshop format, time of day and length of time for events. ASEE@SU also has inside knowledge of the graduate population, including how and where to advertise events, which event topics are preferred, and which formats are well attended. The collaboration has also helped the STEM Librarian gain pertinent insights on how to spin traditional library research topics for greater appeal. A recent example of this was a co-planned workshop for ECS graduate students on self-paced learning resources, including university and library subscription resources, such as Lynda.com, Skillsoft, and JoVE as well as open-educational resources for programmers. This workshop is a good example of promoting and utilizing some of the Libraries' lesser known resources to help empower graduate students to improve their technical and soft skills.

A key mutual benefit of the collaboration includes using funding from both organizations to create appealing and well-constructed events. The partnership with ASEE@SU has helped the STEM Librarian learn to navigate the Graduate Student Organization (GSO) funding structure and secure special programming funds and become a GSO Service Provider. A Service Provider is a designation given to non-student university organizations who apply to receive GSO funding to develop programs and services for graduate students. To become a Service Provider, proposals are submitted to the GSO annually. Proposals typically include event plans and descriptions along with an itemized budget with the total amount being requested for the year. If designated as a Service Provider, the GSO transfers funds directly to the organization to use for programs and events throughout the year. For the Libraries, having a source of regularized funding to develop non-curricular educational programming for graduate students has been critical in meeting student outreach objectives.

ASEE@SU and SU Libraries have each benefited from this collaborative partnership, along with the many graduate students who have participated in our events. Feedback data collected after both student organization- and librarian-hosted events show that attendees enjoyed the workshops and felt that they were effective. Critz et al. found through post-event feedback that graduate students had increased confidence and competence levels for skills such as citation management, increased knowledge of research tools, greater comfort level with the research process, and most importantly a connection to their librarians for ongoing support [11]. From the literature, we know that these areas of graduate development are often overlooked by faculty [3-5] [14]. Rao believes that soft skills are imperative to the employability of engineering students and that "education institutions must prepare them by providing regular soft skills training

programs” [14]. We believe that our organizations are strategically positioned to intervene and help foster graduate students’ academic and future career success.

## **Conclusions**

Through continued partnership, the student organization and the Libraries have found ways to synergistically meet their overlapping objectives of educating graduate students for increased academic and future career success. Workshops geared towards graduate students to expose them to resources, especially those geared towards STEM students, are now planned together. The STEM Librarian frequently attends ASEE@SU board meetings to help brainstorm programming ideas, plan events, and identify potential opportunities to connect graduate students to the Libraries’ resources and services. Future work between our organizations will include combining and co-developing assessment tools and outcomes, while continuing to examine our collaborative outreach efforts in a holistic way to better understand and support the STEM graduate student population. .

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### Appendix A.1: Student Soft Skill Interest Survey – 2017

Please rate your enthusiasm for the following workshop subjects. 1 = I would not attend, 2 = Uninterested, 3 = Neutral, 4 = Interested, 5 = Highly interested.

- \_\_\_\_\_ Time Management and Scheduling
- \_\_\_\_\_ Writing for a Journal Article
- \_\_\_\_\_ Citation Management Software
- \_\_\_\_\_ Data Presentation and Management
- \_\_\_\_\_ Surviving Grad School
- \_\_\_\_\_ Journal Analysis and Discussion
- \_\_\_\_\_ Mentoring an Undergrad
- \_\_\_\_\_ Abstract Writing
- \_\_\_\_\_ Financial Planning
- \_\_\_\_\_ Career Panels
- \_\_\_\_\_ Effective Oral Presentations
- \_\_\_\_\_ Ins and Outs [AG12] of Publication
- \_\_\_\_\_ Lab Management
- \_\_\_\_\_ Conflict Resolution

Are there other ideas for workshops that you would enjoy going to?

What time of day would you prefer having an event? (Pick only one):

\_\_\_\_\_ Morning \_\_\_\_\_ Afternoon \_\_\_\_\_ Evening (after 5 PM) \_\_\_\_\_ No preference

How much time would you be willing to spend attending activities? (Pick only one):

\_\_\_\_\_ An hour \_\_\_\_\_ A few hours (2 to 3 hours)  
\_\_\_\_\_ A half-day (4 to 6 hours) \_\_\_\_\_ A full day

## Appendix A.2: Student Soft Skill Interest Survey – 2018

Please rate your enthusiasm for the following workshop subjects. 1 = I would not attend, 2 = Uninterested, 3 = Neutral, 4 = Interested, 5 = Highly interested.

- \_\_\_\_\_ Time Management and Scheduling
- \_\_\_\_\_ Citation Management Software
- \_\_\_\_\_ Data Presentation and Management
- \_\_\_\_\_ Stress Management
- \_\_\_\_\_ Establishing an Online Presence
- \_\_\_\_\_ Mentoring an Undergrad
- \_\_\_\_\_ Abstract Writing
- \_\_\_\_\_ Financial Planning
- \_\_\_\_\_ Career Panels
- \_\_\_\_\_ Effective Oral Presentations
- \_\_\_\_\_ Ins and Outs of Publication
- \_\_\_\_\_ Lab Management
- \_\_\_\_\_ Conflict Resolution

Are there other ideas for workshops that you would enjoy going to?

What time of day would you prefer having an event? (Pick only one):

\_\_\_\_\_ Morning \_\_\_\_\_ Afternoon \_\_\_\_\_ Evening (after 5 PM) \_\_\_\_\_ No preference

How much time would you be willing to spend attending activities? (Pick only one):

\_\_\_\_\_ An hour \_\_\_\_\_ A few hours (2 to 3 hours)  
\_\_\_\_\_ A half-day (4 to 6 hours) \_\_\_\_\_ A full day

### Appendix A.3: Structure for 2017 retreat

<b>Time</b>	<b>Event</b>
<b>DAY 1 – May 23<sup>th</sup></b>	
<b>9:00 AM – 9:30 AM</b>	<b>Breakfast with the Dean</b>
<b>9:30 AM – 10:30 AM</b>	<b>Communicating Science to Non-Scientific Audience</b>
<b>10:30 AM – 11:30 AM</b>	<b>Using Citation Management Software</b>
<b>11:30 AM</b>	<b>Lunch and Dismissal</b>
<b>Day 2 – May 24<sup>th</sup></b>	
<b>9:00 AM – 9:30 AM</b>	<b>Breakfast with the Dean</b>
<b>9:30 AM – 10:30 AM</b>	<b>Data Presentation</b>
<b>10:30 AM – 11:30 AM</b>	<b>Writing for Journal Articles</b>
<b>11:30 AM</b>	<b>Lunch and Dismissal</b>
<b>Day 3 – May 25<sup>th</sup></b>	
<b>1:00 PM – 3:00 PM</b>	<b>Pitch Competition</b>
<b>4:00 PM</b>	<b>Networking Social at The Inn Complete</b>

**Appendix A.4: Schedule for 2018 retreat.**

<b>Time</b>	<b>Event</b>
<b>DAY 1 – May 16<sup>th</sup></b>	
<b>8:30 AM – 9:15 AM</b>	<b>Breakfast with the Dean</b>
<b>9:30 AM – 10:30 AM</b>	<b>Data Presentation</b>
<b>10:45 AM – 12:15 PM</b>	<b>Time Management</b>
<b>12:15 PM</b>	<b>Lunch and Dismissal</b>
<b>Day 2 – May 23<sup>rd</sup></b>	
<b>8:30 AM – 9:15 AM</b>	<b>Breakfast with the Dean</b>
<b>9:30 AM – 11:30 AM</b>	<b>Developing a Research Profile</b>
<b>11:45 AM – 12:45 PM</b>	<b>Career Panel</b>
<b>12:45 PM</b>	<b>Lunch and Dismissal</b>
<b>Day 3 – May 30<sup>th</sup></b>	
<b>11:00 AM – 1:00 PM</b>	<b>Pitch Competition</b>
<b>1:30 PM – 2:30 PM</b>	<b>Diversity Exercises for the Classroom</b>
<b>3:00 PM – 4:30 PM</b>	<b>Networking Social at The Inn Complete</b>

## Appendix B.1 Speed Dating and Research Librarians Survey

### Speed Dating the Research Experts Event Feedback Form

Your feedback will help us plan for and improve events like this in the future.

Did you attend the February 1st "Speed dating the research experts" event hosted by ECS-GSO, ASEE, and SU Libraries?    \_\_\_\_ Yes    \_\_\_\_ No

How did you hear about this event?

\_\_\_\_ Department e-mail/listserv

\_\_\_\_ GSO event e-mail

\_\_\_\_ Word-of-mouth

\_\_\_\_ Other \_\_\_\_\_

Were the 7-minute meetings sufficient as a broad introduction to the Experts/Topics?

\_\_\_\_ Yes

\_\_\_\_ No

\_\_\_\_ Other \_\_\_\_\_

Did you have an opportunity to discuss your research needs?

\_\_\_\_ Yes

\_\_\_\_ No

\_\_\_\_ Other \_\_\_\_\_

Which topics were most relevant to you?

\_\_\_\_ Starting the research process

\_\_\_\_ Author's Rights and Open Access

\_\_\_\_ SU's repository, SURFACE

\_\_\_\_ Research Impact

\_\_\_\_ Data services and tools

\_\_\_ Funding opportunities

\_\_\_ Other \_\_\_\_\_

What did you gain from attending this event?

\_\_\_\_\_  
\_\_\_\_\_

List any topics you would like to see at future events:

\_\_\_\_\_  
\_\_\_\_\_

Was the location suitable for this event? Why or Why not?

\_\_\_\_\_  
\_\_\_\_\_

Was the timing suitable for this event? Why or why not?

\_\_\_\_\_  
\_\_\_\_\_

Do you plan to attend any of the follow up Research Roundtable events happening on Thursday evenings this semester?

\_\_\_ Yes

\_\_\_ No

\_\_\_ Maybe

Would you be interested in attending a similar event...

\_\_\_ This semester

\_\_\_ Over the summer

\_\_\_ Next academic year

\_\_\_ Not interested in attending

\_\_\_ Other \_\_\_\_\_

Please share additional feedback here.

\_\_\_\_\_  
\_\_\_\_\_

**Appendix B.2 Library Event Post Surveys**

**Graduate Research Roundtable Feedback Form - April 2018**

**Your feedback will help us plan for and improve events like this in the future.**

**How did you hear about this event?**

\_\_\_\_\_ Department e-mail/Listserv

\_\_\_\_\_ GSO Event E-mail

\_\_\_\_\_ University/Library Events Calendar

\_\_\_\_\_ Other

**Did you have an opportunity to discuss your research needs?**

\_\_\_\_\_ Yes

\_\_\_\_\_ No

**Which topics were most relevant to you? (across all roundtables)**

\_\_\_\_\_ Subject-Specific Library Resources

\_\_\_\_\_ Author's Rights and Open Access

\_\_\_\_\_ SU's repository, SURFACE

\_\_\_\_\_ Data services and tools

\_\_\_\_\_ Funding Opportunities

\_\_\_\_\_ Career search/research techniques

\_\_\_\_\_ Other

**What did you gain from attending this event?**

**List topics you would like to see at future events:**

**Was the location suitable for this event? Why or Why not?**

**Was the timing suitable for this event? Why or why not?**

**Do you plan to attend any more Research Roundtable events happening on Thursday evenings this semester?**

\_\_\_\_\_ Yes

\_\_\_\_\_ No

\_\_\_\_\_ Maybe

**Would you be interested in attending a similar event...**

\_\_\_\_\_ This semester

\_\_\_\_\_ Over the summer

\_\_\_\_\_ Next academic year sometime

\_\_\_\_\_ Not interested in attending

**Please share additional feedback here.**

## Appendix C.1: Post-Event Survey – 2017

Last 4 digits of College ID \_\_\_\_\_

On which days did you attend the retreat?

\_\_\_\_\_ Tuesday, May 23<sup>rd</sup>

\_\_\_\_\_ Wednesday, May 24<sup>th</sup>

\_\_\_\_\_ Thursday, May 25<sup>th</sup>

On the days that you attended, did you stay for the whole time? If not, please specify what events you were present for.

Indicate your agreement with the following statements using a scale of 1-5, where 1=Strongly Disagree and 5=Strongly Agree.

\_\_\_\_\_ Soft skills are an important aspect of graduate level education.

\_\_\_\_\_ Being proficient in soft skills makes me a more desirable candidate for jobs, whether they are in academia, government, or industry.

\_\_\_\_\_ Learning soft skills is just as important as learning the traditional skills taught in standard courses.

\_\_\_\_\_ Attending workshops and seminars is the best way to hone soft skills.

\_\_\_\_\_ I know some techniques to communicate my scientific work to non-technical audiences.

\_\_\_\_\_ I am an effective scientific writer.

\_\_\_\_\_ I have a good set of time management practices.

\_\_\_\_\_ I am able to create effective visuals to present my data.

\_\_\_\_\_ I am able to communicate my research goals and aims effectively.

\_\_\_\_\_ I know how to use citation management software.

\_\_\_\_\_ I know how to maintain a high level of integrity while conducting my research.

Indicate your agreement with the following statements using a scale of 1-5, where 1=Strongly Disagree and 5=Strongly Agree.

\_\_\_\_\_ The Mini Retreat was well organized.

\_\_\_\_\_ I was presented with several methods that I can use in my career to be more effective.

\_\_\_\_\_ I found the pitch event to be helpful for increasing my presentation skills.

\_\_\_\_\_ Attending workshops and seminars is the best way to hone soft skills.

\_\_\_\_\_ The presenters and speakers were informative and effective.

\_\_\_\_\_ The judging panel for the pitch event was balanced and provided useful feedback.

\_\_\_\_\_ The Writing Center specialists were helpful in strengthening my skills as a writer.

\_\_\_\_\_ The time management panel provided methods to help me manage my time better.

\_\_\_\_\_ If available, I would attend the Mini Retreat again.

\_\_\_\_\_ I felt that the Mini Retreat was worth the time that I spent at the event.

\_\_\_\_\_ I did not mind having to put in some time before the event to prepare material.

\_\_\_\_\_ The event was a complete waste of my time.

\_\_\_\_\_ The skills discussed at the event were irrelevant to being a scientist/engineer.

Please answer the following questions to the best of your abilities:

What were the best parts of the retreat?

Would you recommend this event to fellow students in your department?

What changes would you make to the retreat?

Do you have anything else you would like the organizers of this event to know?

## Appendix C.2: Post-Event Survey – 2018

Last 4 digits of College ID \_\_\_\_\_

College and Department \_\_\_\_\_

Program of Study

\_\_\_\_ PhD

\_\_\_\_ Masters

\_\_\_\_ Other

On which days did you attend the retreat?

\_\_\_\_ Wednesday, May 16<sup>th</sup>

\_\_\_\_ Wednesday, May 23<sup>rd</sup>

\_\_\_\_ Wednesday, May 30<sup>th</sup>

For the days that you attended, which of the events did you participate in?

\_\_\_\_\_ May 16<sup>th</sup>: Breakfast Talk w/ Dr. Gurdhip Singh.

\_\_\_\_\_ May 16<sup>th</sup>: Data Presentation w/ Prof. Adam Peruta

\_\_\_\_\_ May 16<sup>th</sup>: Time Management w/ Dr. Jay Henderson

\_\_\_\_\_ May 23<sup>rd</sup>: Breakfast Talk w/ Dr. Julie Hasenwinkel

\_\_\_\_\_ May 23<sup>rd</sup>: Developing a Research Profile w/ Emily Hart

\_\_\_\_\_ May 23<sup>rd</sup>: Career Panel w/ Dr.'s Michelle Blum, Huan Gu, and Jessica Lo Surdo.

\_\_\_\_\_ May 30<sup>th</sup>: Pitch Competition

\_\_\_\_\_ May 30<sup>th</sup>: Diversity and Inclusion in the STEM Workplace w/ Dr. Stephanie Farrell

\_\_\_\_\_ May 30<sup>th</sup>: Networking Social @ The Inn Complete

Did you attend all of the days/events that you signed up for?

\_\_\_\_ Yes

\_\_\_\_ No

If you did not attend the events/days that you registered for, what was the reason for you not attending?

\_\_\_\_\_ My other duties took precedent

\_\_\_\_\_ I no longer felt motivated to go to the event

\_\_\_\_\_ The changing of the location or time made it inconvenient

\_\_\_\_\_ Not enough information was given by the executive team

\_\_\_\_\_ Other

Indicate your agreement with the following statements using a scale of 1-5, where 1=Strongly Disagree and 5=Strongly Agree.

\_\_\_\_\_ Soft skills, such as communication and time management, are important skills for grad students to learn.

\_\_\_\_\_ Being proficient in soft skills makes me a more desirable candidate for jobs, whether they are in academia, government, or industry.

\_\_\_\_\_ Using hands-on and interactive workshops is an effective method for learning soft skills.

\_\_\_\_\_ I know several different methods of time management.

\_\_\_\_\_ I know how to make the most effective visuals for publications and posters.

\_\_\_\_\_ I can explain and make comparisons between the different career paths that are available to me.

\_\_\_\_\_ I have the tools available to construct an online research profile.

\_\_\_\_\_ I am confident in my ability to effectively discuss and communicate my research to a variety of audiences.

\_\_\_\_\_ I am prepared for dealing with situations regarding diversity issues in the workplace.

\_\_\_\_\_ I felt that the Mini Retreat was well organized.

\_\_\_\_\_ I found that the speakers and workshop leaders were informative and effective.

\_\_\_\_\_ I did not enjoy the retreat, and found it to be a waste of time.

\_\_\_\_\_ I would not attend a Mini Retreat again unless massive changes were made.

What were the overall strengths of the retreat?

What are some things that could have improved the retreat?