Soft Skills Boot Camp: Designing a Three-day Student-run Seminar and Workshop Series for Graduate Students

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Abstract

A common challenge amongst the graduate student population is finding time to work on desirable soft skills that would create a more dynamic applicant for academic and industrial jobs. Between lectures, classes, research, and duties required for assistantships or fellowships, graduate students have little time left over to attend workshops or seminars to cultivate these proficiencies. This has been a noticed occurrence with scheduled events put on by our student chapter. To combat low attendance, we hosted a three-day "boot camp" between the spring and summer semesters. This was considered opportune timing because students did not have class and had fewer time constraints, as they were transitioning from lesser to greater research responsibilities. Students were required to register for the event ahead of time using an online form, which also allowed us to determine beforehand how many students to expect. The objectives of this event were to 1) increase graduate students' proficiencies in research- and career-related soft skills; 2) connect students with available campus resources; and 3) increase networking and communication between the engineering departments. To determine what topics should be covered, two separate surveys were used; one that asked students to identify what topics they believed would benefit them the most, and one from the faculty on what developmental needs they saw for their students. Based on this data, a finalized set of seminars and workshops were developed, which covered topics such as writing skills, citation management, responsible conduct of research, making effective figures, time management, and oral communication. Guest speakers were all faculty and staff members from the university, including professors from the College of Engineering and School of Public Communications, and the University Library. Pre- and post-event surveys were used to gather audience enthusiasm and confidence in their skills. Overall, positive feedback was gathered both before and after the retreat. Our chapter plans on rerunning this program with some changes to the skills that will be discussed. We will also change the scheduling of the event so that it takes place one day per week for three weeks, as opposed to three consecutive days, in an effort to boost attendance.

Introduction

Soft skills are an important aspect of engineering education. The Accredation Board for Engineering and Technology lists several soft, or professional, skills that should be covered in the engineering curriculum: communication, teamwork, ethical responsibility, and lifelong learning [1]. While students are expected to have these skills, there is evidence of a mismatch between the skills learned in academia versus what is needed in the professional workforce [2]. As such, faculty have developed methods to incorporate professional skill learning into the classroom. Mohan et al. developed a two-semester graduate course that was aimed at improving professional skills, highlighting pedagogy and leadership skills [3]. Bernd Schulz of Polytechnic of Namibia advised educators to find ways to incorporate soft skills into hard skill courses at the graduate level [4]. Kumar and Hsiao also discussed the lack of time for graduate students to learn leadership skills [5].

The Student Chapter of the American Society for Engineering Education at Syracuse University (abbreviated ASEE@SU) is a graduate student group; its goal to improve soft skill capabilities among graduate students. During the 2016-2017 academic year, seminars and workshops on topics such as managing citations, writing grants, developing clear visuals, and mentoring undergraduate students were hosted. While these topics were thought to be essential and engaging to students, the events had low attendance. It was unclear if graduate students found the topics uninteresting or if students could not attend due to scheduling conflicts. With these points in mind, we decided to host a three-day series of workshops to give students the opportunity to develop their professional skills. Polls were sent to the student body and the College of Engineering faculty in order to ensure that topics were chosen that students would be interested in attending, but faculty members also felt were useful for their students. Since graduate students have many responsibilities during the academic year (e.g., research, meetings, classes, etc.), May was considered the opportune month to host soft skill development workshops as classes and teaching assistantship duties were over, but summer research activities would not have yet increased. There was also a lack of skill development seminars and workshops over previous summers, allowing a gap to be filled with this retreat.

Further details on planning the retreat and structuring events are discussed in the following sections. Comments on improving the retreat based on feedback from retreat participants on which events were most successful, and which aspects needed improvement, will also be shown. It should be noted that this retreat was designed using only student and faculty input at Syracuse University: no other literature or resources were used.

Student and Faculty Polling Data

To determine what topics to cover during the retreat, surveys were electronically sent to both students and faculty of the College of Engineering. Student responders were asked to rate how likely they would attend an event that covered a specific skill. Meanwhile, faculty responders were asked to rank what soft skills they believed their students were lacking. Surveying both the student and faculty was done to build a retreat that answered both the developmental needs of the students and to address the developmental deficiencies identified by the faculty. Other questions asked what time during the day events should take place and how long these events should be. The comments section allowed graduate students and faculty to propose topics not included in

the survey. Topics that would be included in the retreat covered in the rating section were chosen by the executive board of ASEE@SU; these were time management and scheduling, citation management, and writing for a journal article. All the topics that were listed in the survey can be seen in Figure 1. The surveys sent to both the students and the faculty can be found in Appendix A.1 and A.2, respectively.

For the 2017 event, 30 responses for graduate students and 7 responses for faculty were collected. The results of the survey are shown in Figure 1. Graduate students also requested topics on preparing for qualifying and candidacy exams, resolving conflicts between the student and advisor, securing grants and scholarships, and negotiating salaries with employers. Faculty requested topics on networking during conferences and reviewing necessary grammar skills.

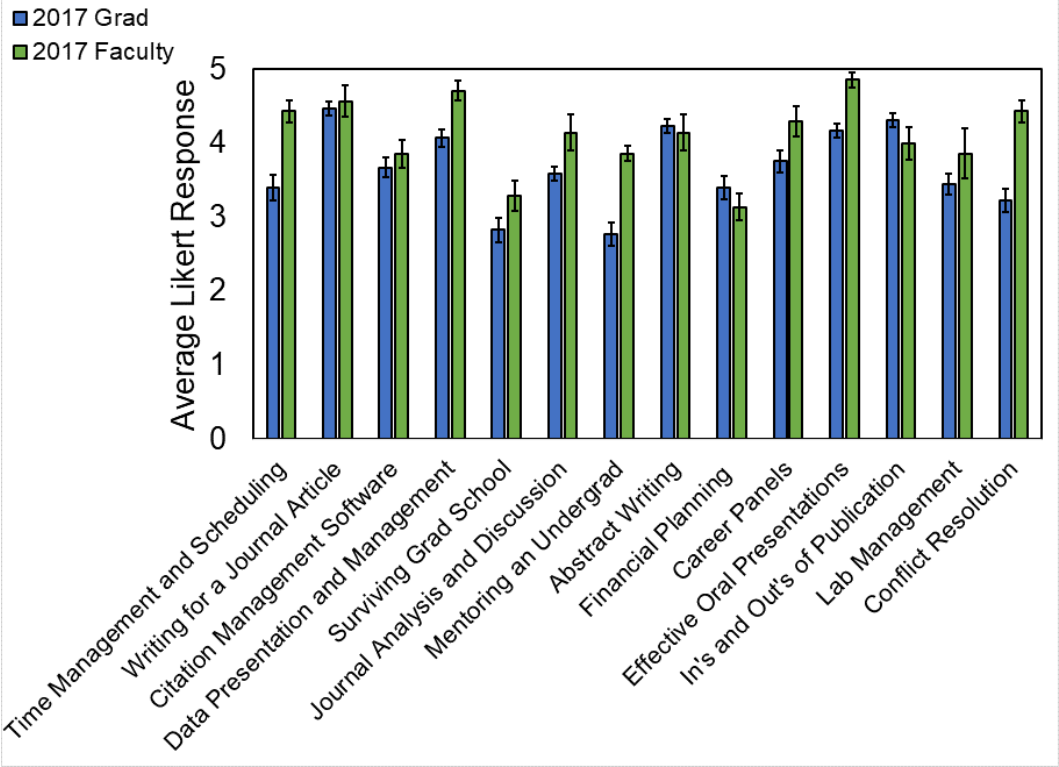


Figure 1. Bar graph of the average responses received from the topic polling surveys. Students were asked to rank on a scale of 1-5 how likely they were to attend the stated event (where 1 = will not attend and 5 = very likely to attend), while faculty were asked to rate how important the event was for their students to attend (1= not important, 5= highly important) based on what they identified as the developmental need of the students. Error bars show a 95% confidence interval.

Faculty and student responses varied in several areas. The graduate students did not rate time management, conflict resolution, mentorship, data presentation and management, and effective oral presentation skills as highly compared to faculty, suggesting that there may be differences in the value of these skills between the two populations. Graduate students also rated financial planning much higher than faculty. No significant differences were found between the two groups on the remaining skills. Most skills scored a 3 or more, indicating that the average

graduate response rated all seminars, except stress management and mentorship, above neutral interest.

Graduate students and faculty were also asked how much time they thought graduate students should dedicate to skill development seminars (Figure 2). The graduate students had the highest response for 2-3 hours a day, while the faculty preferred spending time for 1 hour at most. The time of day that the event should take place was likewise requested (Figure 3). The responses from graduate students and faculty were split relatively evenly between all the time points.

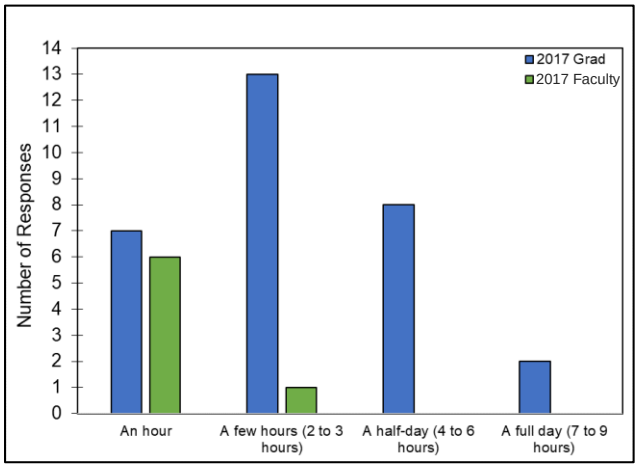


Figure 2. Polling results for what amount of time graduate student and faculty would dedicate per day on skill development seminars.

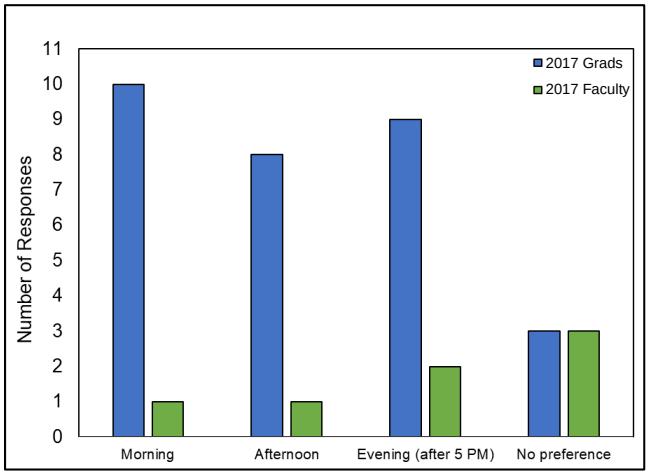


Figure 3. Polling results on what time of day both graduate students and faculty thought that graduate students could attend skill development seminars.

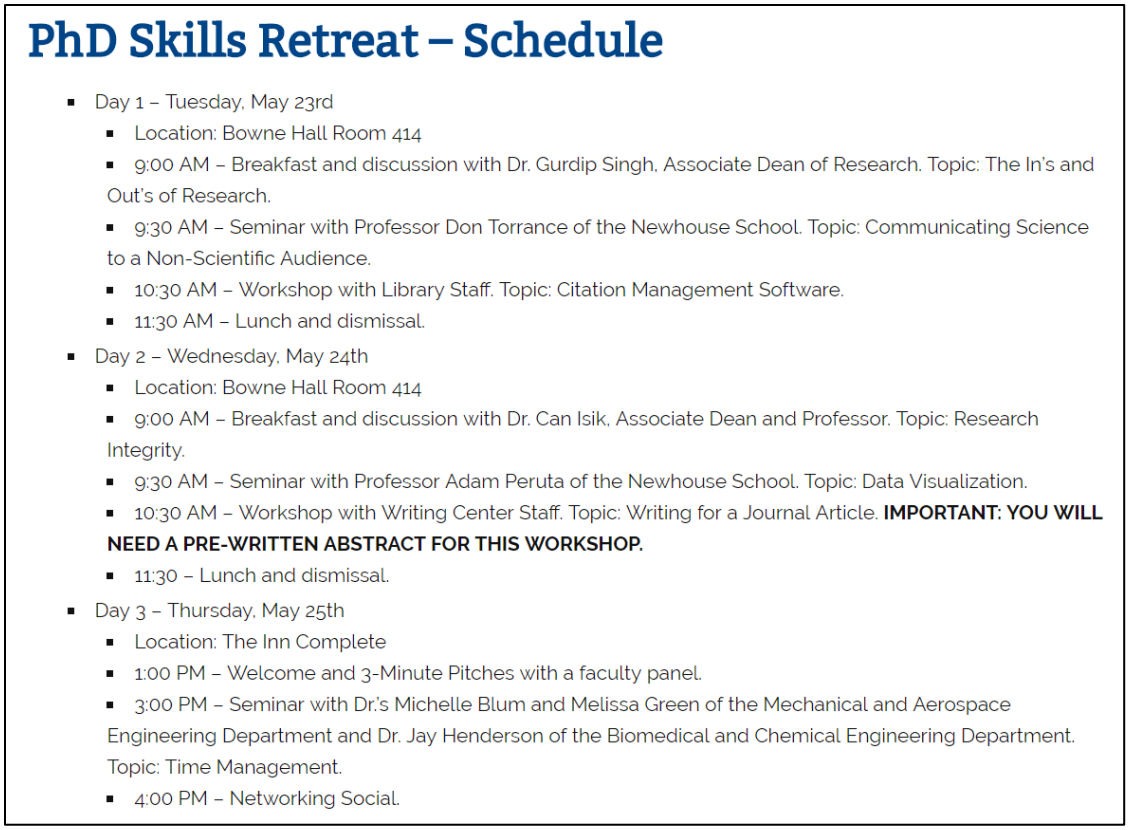
Structure of Retreat

The structure of the retreat was based on the responses from the polling surveys. Three consecutive days (May 23-25) were chosen, with events held on half-day (4 hours maximum) schedules. Events for the retreat were chosen based on student and faculty responses as shown in

Figure 1 above. More weight was given to faculty responses; however, events were ultimately organized and chosen based off resources available on campus. As such, some event topics could not be covered (such as conflict resolution) since we could not find a suitable resource on campus. For the first two days, the retreat was run in the morning (9:00 A.M. to 11:30 A.M.) while on the last day, the retreat was held in the afternoon (1:00 P.M. to 5:00 P.M.).

The details of the retreat were sent to all graduate students via email and the students were required to register on a first come, first serve basis with a cap of 30 registrations. If participants could not attend one day of the retreat, students were still allowed to attend. Meals were provided each day to stimulate attendance. There were 23 registered participants in the retreat. Gender/ethnic background of participants was not collected, as the intended purpose of the workshop was to increase soft skill development, and not enhancing diversity.

The schedule for the retreat is shown in Figure 4. At the start of the morning sessions, discussions were held over breakfast with deans from the College of Engineering to engage participants. This was an important part of the retreat since many deans at SU have been looking for ways to better connect with the student body: we addressed this need by hosting the deans to talk with the participants. The skill development workshops were held afterward. On the first day, we held workshops on communicating science and engineering to non-technical audiences and on managing citations using citation management software. On the second day, we held workshops on visualizing data and on writing abstracts. Faculty from the Newhouse School of Communications led workshops on communicating science and engineering and visualizing data, staff from SU Libraries instructed on downloading and using citation management software, and staff from the SU Writing Center assisted workshop participants on revising and editing research abstracts.



PhD Skills Retreat – Schedule

- Day 1 – Tuesday, May 23rd
  - Location: Bowne Hall Room 414
  - 9:00 AM – Breakfast and discussion with Dr. Gurdip Singh, Associate Dean of Research. Topic: The In's and Out's of Research.
  - 9:30 AM – Seminar with Professor Don Torrance of the Newhouse School. Topic: Communicating Science to a Non-Scientific Audience.
  - 10:30 AM – Workshop with Library Staff. Topic: Citation Management Software.
  - 11:30 AM – Lunch and dismissal.
- Day 2 – Wednesday, May 24th
  - Location: Bowne Hall Room 414
  - 9:00 AM – Breakfast and discussion with Dr. Can Isik, Associate Dean and Professor. Topic: Research Integrity.
  - 9:30 AM – Seminar with Professor Adam Peruta of the Newhouse School. Topic: Data Visualization.
  - 10:30 AM – Workshop with Writing Center Staff. Topic: Writing for a Journal Article. **IMPORTANT: YOU WILL NEED A PRE-WRITTEN ABSTRACT FOR THIS WORKSHOP.**
  - 11:30 – Lunch and dismissal.
- Day 3 – Thursday, May 25th
  - Location: The Inn Complete
  - 1:00 PM – Welcome and 3-Minute Pitches with a faculty panel.
  - 3:00 PM – Seminar with Dr.'s Michelle Blum and Melissa Green of the Mechanical and Aerospace Engineering Department and Dr. Jay Henderson of the Biomedical and Chemical Engineering Department. Topic: Time Management.
  - 4:00 PM – Networking Social.

Figure 4. The schedule of events for the retreat. While the title was "PhD Skills Retreat," we also welcomed master's students to participate. Names and locations redacted for the blind review.

On the third day, the retreat began in the afternoon with a research pitch competition. The participants had 3 minutes to "pitch" their research topics to senior-level graduate students and staff from SU Career Services. The panel scored all participants, and the top three pitches were given prizes. A panel discussion on time management followed with several faculty members from the College of Engineering. We concluded the retreat with an informal networking social for all workshop participants, faculty and staff who assisted us with workshops, and members of the ASEE@SU executive board. All faculty, staff, senior graduate students, and panel members who volunteered their time for the retreat were given a small gift as an honorarium.

Assessment

To obtain feedback from participants, we sent out several surveys via email. Before the first event of the retreat, we asked all participants to answer an anonymous survey on their thoughts related to several aspects of the retreat using a Likert scale (1 – Strongly Disagree to 5 – Strongly Agree). This was the "before" survey. Each question from the anonymous survey is shown in Table 1. The coded statements are used for data analyses discussed in this section. The entire survey is in Appendix B.

Table 1. A list of the survey statements used during the "before" assessment survey. The coded statements will be used for analysis.

Coded Statement	Statement
Soft Skills - Importance	Soft skills are an important aspect of graduate level education.
Soft Skills - Proficiency	Being proficient in soft skills makes me a more desirable candidate for jobs, whether they are in academia, government, or industry.
Soft Skills - Learning	Learning soft skills is just as important as learning the traditional skills taught in standard courses.
Workshop Attendance	Attending workshops and seminars is the best way to hone soft skills.
Communicate Non-Scientific	I know some techniques to communicate my scientific work to non-technical audiences.
Scientific Writing	I am an effective scientific writer.
Time Management	I have a good set of time management practices.
Effective Visuals	I am able to create effective visuals to present my data.
Communicating Science	I am able to communicate my research goals and aims effectively.
Citation Management	I know how to use citation management software.
Research Integrity	I know how to maintain a high level of integrity while conducting my research.

Another survey was sent out to participants on the third day- an "after" survey. We asked attendees to list which days they attended, and which events during those days they participated in. The same Likert scale survey was used. The comparison of before and after results from the two surveys are shown in Figure 5. We found that participants came in with high levels of self-reported competence for most statements in Table 1 except for "Scientific Writing", "Communicatin Science", and "Citation Management" ("I am an effective scientific writer", "I am able to communicate my research goals and aims effectively", and "I know how to use citation management software", respectively).

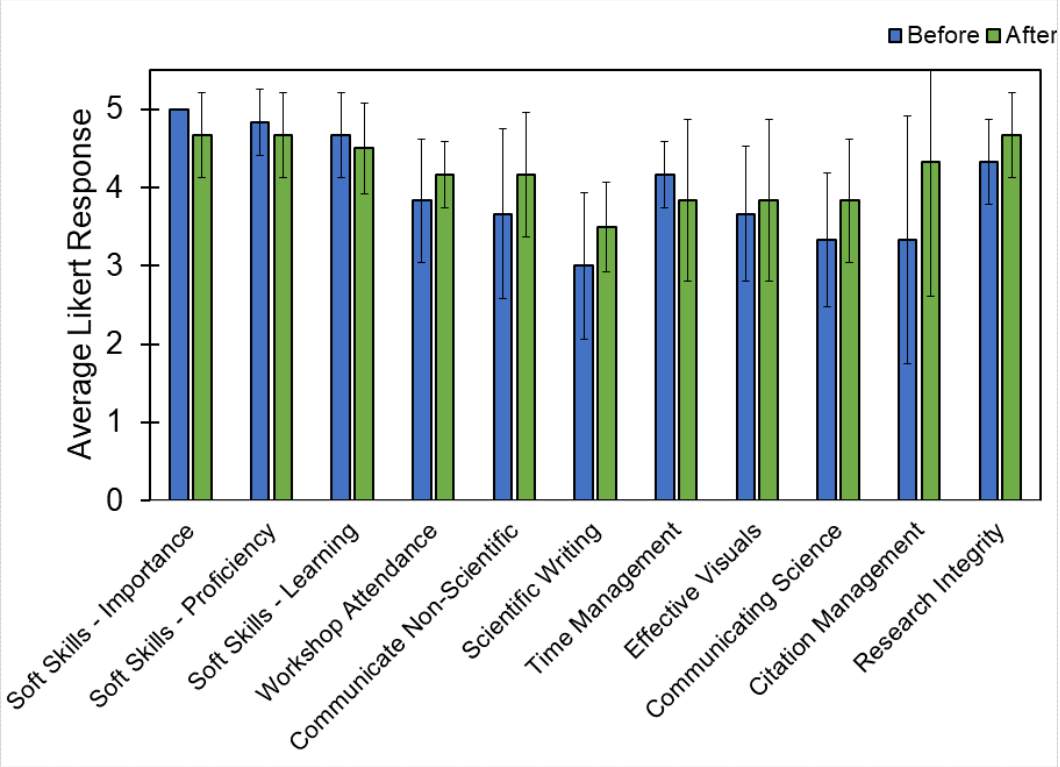


Figure 5. The average participant response to the Likert survey before and after the event. The coded statements correspond to those listed in Table 1. Error bars are 95% confidence intervals.

There was also high variability in responses for both surveys. This could be explained by participants' prior exposure to tools for managing citations and visualizing data, which may, in turn, explain the variability in responses for "Effective Visuals" and "Citation Management". Also, not all participants responded to both surveys; there were fewer responders to the "after" survey, and the total number of responses to the "before" survey did not match up with the number of participants who initially registered for the retreat (12 responses to the "before", and 9 responses to the "after"). Despite this, participation in the summer workshop was far superior to participation in events held during the academic year. For instance, a data visualization event held earlier in the semester had only 4 students in attendance, as compared with the 23 attendees we received in the summer. This trend was apparent for several topics that were previously offered, such as citation management and writing skills.

In the "after" survey, we asked participants to give feedback on the timing and structuring of the events. The statements from this aspect of the survey and the average Likert responses are shown in Table 2. Feedback was positive. The last section of the survey included four open-ended questions for participants to give more on specific feedback on improving the timing and structuring of events. The entire survey is in Appendix C.

Only 6 respondents answered all four of the open-ended portion of the "after" survey. Positive feedback was gathered for a majority of responses. One particular example would be a response saying "I really loved this retreat! Extremely helpful in knowing people to contact for certain things like graduate career services and engineering library staff." Comprehensive suggestions

on how to improve the retreat were also collected. An example is one respondent suggesting: "More interactive workshops with the presentations so we can work on our skills and get feedback directly from the specialists."

Table 2. The average response to the second Likert-scale portion of the "after" survey with a standard error of the mean.

Statement	Average Response (± SEM)
The Mini Retreat was well organized.	4.22 (±0.30)
I was presented with several methods that I can use in my career to be more effective.	4.33 (±0.26)
I found the pitch event to be helpful for increasing my presentation skills.	4.71 (±0.30)
The presenters and speakers were informative and effective.	4.00 (±0.30)
The judging panel for the pitch event was balanced and provided useful feedback.	4.29 (±0.28)
The Writing Center specialists were helpful in strengthening my skills as a writer.	4.33 (±0.18)
The time management panel provided methods to help me manage my time better.	4.43 (±0.28)
If available, I would attend the Mini Retreat again.	4.38 (±0.33)
I felt that the Mini Retreat was worth the time that I spent at the event.	4.33 (±0.25)
I did not mind having to put in some time before the event to prepare material.	4.44 (±0.25)
The event was a complete waste of my time.	1.56 (±0.26)
The skills discussed at the event were irrelevant to being a scientist/engineer.	1.44 (±0.26)

Summary and Outlook

A three-day retreat for graduate students was designed to improve soft skills. Events were chosen based on separate surveys sent to graduate students and faculty, asking which skills

students were interested in improving and which faculty felt were lacking among graduate students. The faculty and staff who assisted with the skill development workshop were chosen based on the executive board's knowledge of their background and expertise. Topics ranked by the faculty were given priority, however topics were ultimately limited based off the resources available on campus.

Turnout for this retreat was a successfully increased, with more graduate students involved in the retreat compared to individual workshops held throughout the academic year. For example, we hosted a data visualization seminar that attracted 4 graduate students during the semester; the retreat, with 23 registered participants, was more than a 400% increase in attendance. A 2018 retreat is being prepared and will be based on participant feedback from the "after" survey, as well as polling data similar that described above. Because of the success in turnout, ASEE@SU will continue to host the retreat in future years.

Based on the open-ended responses from the "after" survey, students would like to see improvement in selecting specific speakers to assist with workshops. For example, students pointed out that the staff members who assisted with the citation management workshop were not helpful since the information provided was not tailored to the needs of graduate students. Another typical response from the "after" survey was that participants would like to see events spread over several weeks instead of on consecutive days over one week. This response could be due to scheduling difficulties around research activities: it can be difficult to take time away from projects for a few days in a row. Therefore, the 2018 retreat will be designed so that events will be one day per week for three consecutive weeks in May. We are also hoping to add modules on topics that were of interest to the graduate community, but could not be organized with the current resources available on campus.

Assessment tools could also be refined for the 2018 retreat. Self-reported data can be misleading: participants have different ideas on how to rate themselves, which may explain the variation of competency and knowledge of specific topics in the "before" survey. Because the initial ratings were high, it was difficult to determine how beneficial these workshops were. By working with a faculty member with experience in creating these types of surveys, we hope that they can provide insight for better wording to ensure more accurate interpretation of workshop effectiveness. These changes would allow for improved student involvement and feedback, which in turn improve future retreats. In prospective studies, comparisons will be made between the feedback from the 2017 and 2018 retreats. We may also collect data on gender/ethnicity in future retreats to investigate the diversity of attendees.

While it is unknown if this type of retreat can work for student chapters at other universities, we conclude that feedback from students and faculty helped structure this event. We propose that other chapters solicit similar feedback to ensure that they are addressing the specific needs of the students considering that the graduate student population changes over time. We propose that the structure of this retreat is an effective alternative to semester-based program planning if another chapter is struggling with student involvement.

References

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[2] A. S. Patil, "Global engineering criteria for the development of the global engineering profession," World Transactions on Engineering and Technology Education, vol. 4, no. 1, pp. 49-52, 2005.

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Appendix A.1: Polling survey sent to graduate students.

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

_____ In's and Out's 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: Polling survey sent to engineering faculty.

Please rate the following workshop topics based on how important they would be for your graduate students to attend. 1 = Not at all important, 2 = Not important, 3 = Neutral, 4 = Important, 5 = Very imporant.

_____ 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

_____ In's and Out's of Publication

_____ Lab Management

_____ Conflict Resolution

Do you feel there are other topics that should be covered that would benefit your grad students? If so, what would those topics be?

Which time do you think is best for hosting these events? (Pick only one):

_____ Morning _____ Afternoon _____ Evening (after 5 PM) _____ No preference

How much time per week do you think your grad students should devote to attending workshops? (Pick only one):

_____ An hour _____ A few hours (2 to 3 hours)

_____ A half-day (4 to 6 hours) _____ A full day

Appendix B: The survey given to participants before the retreat.

Last 4 digits of College ID _____

On which days are you planning to attend/did you attend the retreat?

____ Tuesday, May 23rd

____ Wednesday, May 24th

____ Thursday, May 25th

On the days that you plan to attend/attended, did you stay for the whole time? If not, please specify what events you will be/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.

Appendix C: The survey given to participants after the retreat.

Last 4 digits of College ID _____

On which days did you attend the retreat?

____ Tuesday, May 23rd

____ Wednesday, May 24th

____ Thursday, May 25th

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?