Board 330: Looking Back: Alumni Assessment of Activities Offered Through NSF S-STEM Grant

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Abstract

Since the fall of 2008, Gannon University has hosted an NSF-funded S-STEM grant and has awarded scholarships that have helped fund over 70 students to graduation. The S-STEM program we have enacted is structured based on a seminar in which all scholarship recipients must participate. The seminar was and is a key feature of the grant and was, at the time of the initial grant application, unique. Seminar activities include community-service-based design, and aspects of professional and personal development. Personal and professional development activities have been selected to introduce skills that might help students succeed in finding and maintaining employment in their chosen STEM field and help them to advance in their employment thereafter. These activities are not typically offered to students outside the scholarship program. In this paper, we will report on past graduates' perceptions of those "personal and professional development" activities, gathered via a survey of alumni. We seek to understand which activities the past students feel have been advantageous to them, and which might be less so. The goal of the paper is to provide thinking points for other scholarship administrators who might wish to consider inclusion of similar activities.

Introduction

The SEECS (Scholars of Excellence in Engineering and Computing Studies) scholarship program, as approved and funded by the National Science Foundation (Award No., 1107015, 1153250, 1643869, and 2221052). [1-3], has four project goals. These four goals are specifically related to the goals of the NSF S-STEM grant, which seeks to increase the size of the domestic (US citizen and permanent resident) STEM workforce by easing the financial burden of attaining a suitably high education for STEM work, and to identify and disseminate best practices for achieving that goal. The SEECS grant has identified five project objectives to support those four goals.

SEECS-specific objectives (paraphrased) are:

1) Provide 25 scholarships per year on average for low-income, academically talented engineering students;
2) Provide a program of academic and student service support to bolster retention of engineering students relative to the university as a whole;
3) Provide scholarship recipients with academic and professional development beyond the standard curriculum in preparation for employment of advanced studies in STEM;
4) Employ recruitment techniques and strategies to encourage applications from women students as a means of increasing participation of women in engineering careers;
5) Provide specific academic support for students struggling in attrition-point courses.

In support of these objectives, particularly objectives 2 and 3, SEECS has developed a required, zero-credit seminar course that all scholarship recipients are expected to register for, attend and

participate in each semester for which scholarship funding is awarded – nominally all eight semesters of SEECS eligibility, for students recruited as new incoming first-year students [4]. As a means of beginning to understand alumni perceptions the effectiveness of SEECS activities, a survey was created and distributed to all past SEECS alumni who graduated at least one year ago for whom valid email addresses were available or who could be contacted via LinkedIn. Alumni who graduated between 2011 to 2021 were contacted. 33 surveys were distributed, with 16 respondents. The survey was broken into two groups of questions. The first group of questions related to activities included addressing students' professional development, the second was related to activities chosen for their potential merit in addressing personal development. The baseline question was

> "Please rate the following SEECS activities/events on their effectiveness on your (*professional development* or *personal growth*), 1 through 7 with 7 as most effective."

All questions were to be answered on the same 7-point scale. An option to mark NA (not applicable) was also provided. In addition, students were invited to write in personal perceptions or clarifying or additive remarks. In total, 17 questions were asked, with 12 of those related to professional development activities, and 5 related to personal growth. Results are summarized in Table 1 (professional development) and Table 2 (personal growth).

Results: Professional Development

SEECS activities related to professional development have been chosen and tested over the years to address retention, employment potential and bolster enthusiasm for careers in engineering. Some activities serve multiple purposes, as for example, attendance at professional conferences is meant to support both career placement (networking skills) and enthusiasm for the profession (seeing the work of others for inspiration as well as receiving supportive feedback from others) but each is included here only in one category of "primary purpose."

Table 1: Survey results for questions related to SEECS professional development activities (n = 16)

	Please rate the following SEECS activities/events on their effectiveness on your professional development, 1 through 7 with 7 as most effective.	**Strongly agree**						**Strongly disagree**	
		7	**6**	**5**	**4**	**3**	**2**	**1**	**NA**
1	SEECS mentor as secondary academic advisor	31%	13%	19%	25%	0%	0%	6%	6%
2	Guest speaker series	31%	31%	31%	0%	0%	0%	0%	6%
3	Weekly seminar	19%	44%	19%	13%	6%	0%	0%	0%
4	Community service design project	44%	25%	25%	0%	6%	0%	0%	0%
5	Career service support	44%	38%	6%	6%	0%	0%	0%	6%
6	Attending professional conferences	44%	6%	6%	13%	0%	0%	0%	31%
7	Professional membership support	44%	19%	13%	13%	0%	0%	0%	13%
8	Internship shadowing	13%	25%	13%	6%	6%	0%	0%	38%

9	Field trips to local industry or research institute	25%	31%	25%	13%	0%	0%	0%	6%
10	FE exam support	31%	13%	0%	0%	0%	6%	0%	50%
11	GRE and graduate school application support	19%	13%	13%	0%	0%	6%	0%	50%
12	Team with peers from different disciplines	75%	6%	13%	0%	6%	0%	0%	0%

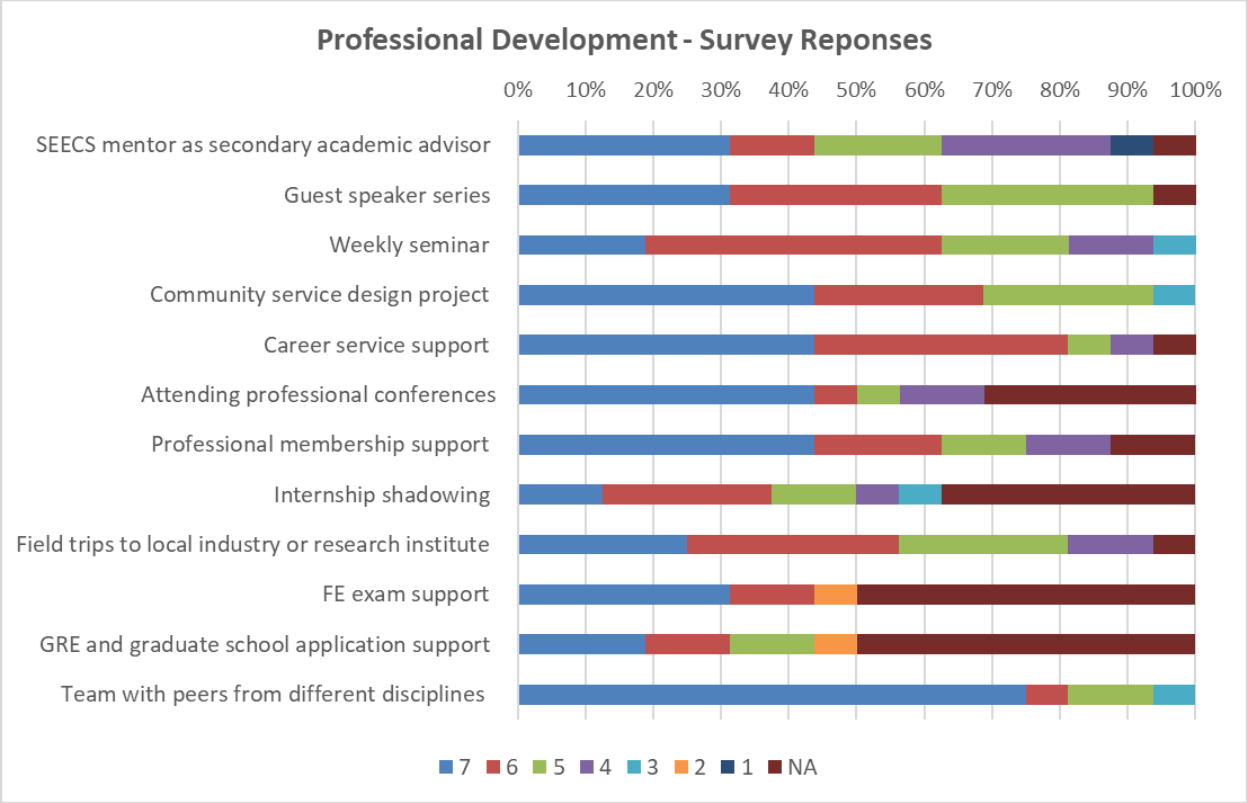

Figure 1: Survey results for questions related to SEECS professional development activities. (n = 16)

Activity number 1: SEECS mentors as secondary advisors

Gannon University utilizes faculty members as academic advisors to students. Each SEECS scholar who is not already assigned a SEECS faculty member as academic advisor is assigned a SEECS faculty member as a secondary advisor. This empowers SEECS faculty members to view student grades and track academic progress whenever official grades are issued (i.e., at the four-week, midterm, and final grade points) as well as provides the freedom to query other professors directly regarding student performance. This freedom allows for frequent contact between the scholar and the SEECS advisor beyond the typical advising the student receives and thus can lead to early intervention when academic dangers begin to arise.

Among all SEECS professional development activities, the SEECS mentors as secondary advisors rated as the lowest in terms of student satisfactions, with weighted average of 5.27. This activity received the most Likert scores of 4 (neutral) or lower, and it is the only item of the

survey for which at least one student strongly disagreed that the activity was effective. No student comments were provided as a means of further exploration of this point – it is unclear whether students felt this was overly intrusive, whether some students might not have received the aid that might have been expected, or whether the aid was not useful, or some other complaint or combination. This is a point that bears further consideration.

Activities numbered 2, 4, 8, 9: Guest speakers, community service project, internship shadowing, Field trips to local industry/research facilities

These activities have been selected to help students see in a more personal way than the classroom allows, how engineers and scientists spend their days, how their work contributes to the greater causes of humanity, and generally to encourage the students to keep the faith, so to speak, that the choice to study engineering is one that leads to personal fulfillment and societal gain.

As a group, these activities scored very highly among students. Weighted averages for the activities were 6.0 (Guest speakers), 6.0 (community service project), 5.5 (internship shadowing) [5] and 5.73 (site visits). A word cloud generated from student comments may be found in Figures 3-6; these comments would suggest that the ability to interact with working professionals, see a professional environment, connect with potential future employers and participate in a meaningful design project were all very effective, though the "internship shadowing," at weighted average of 5.5, is among the lower scoring activities.

Internship shadowing is a technically optional but strongly encouraged activity wherein first-year students, who are not yet eligible for cooperative educational employment per Gannon university requirements, spend an hour shadowing a current cooperative education student on the job. A debrief later over coffee or lunch is budgeted, wherein students convey their impressions and ask exploratory questions of the upper-level student who was shadowed. There were few comments specifically about this, though the Likert average on the lower end of those for survey items indicates students who participated might not have found it very useful.

Activities numbered 5, 6, 7, 10, 11, 12: Career services support, Attendance at professional conferences, FE preparation and registration, GRE preparation and registration, interdisciplinary work

These are activities whose primary goal is preparation of the scholars for placement, post-graduation. The FE and/or GRE are included to give the students a leg up, so to speak – to set them apart from other, otherwise similar applicants. The interdisciplinary work is a consequence of the community service project but is included here as a separate item as this is felt to potentially contribute to success in the workplace – where "majors" are no longer as relevant as the ability to work on teams of diverse skill sets. Career services support is clearly related to post-graduate employment, and conference attendance is included in this grouping of activities as a networking opportunity for students – with a bonus chance to receive positive feedback, thus bolstering enthusiasm towards engineering as a career path.

Taken as a group, these activities geared towards a successful launch into the working world were rated as quite effective by survey respondents. The weighted averages for these items were 6.27 (Career Services support), 6.18 (conference attendance), 6.07 (professional societies membership support), 6.13 (FE exam support), 5.63 (GRE support), 6.44 (interdisciplinary work).

Career Services support consists of engagement directly with the Office of Career Services, wherein representatives of that office come to the weekly seminar to provide invited talks about items of interest to students. Some talks have been "standard" in the material coverage (preparing a resume, job searching, etc.) but we have also been able to offer custom content (dress for success, workplace etiquette, job offer negotiation techniques, among others). We have found that the Career Services staff have been delighted to hear what the students want to know and have responded with tailored content to which students responded well.

Each year, the junior class is required to attend a regional professional conference, typically the ASEE (American Society for Engineering) North Central Section conference and present their design project at a poster session. A couple of the design projects have come home with "best poster presentation" awards, and students invariably come home with at least a sense of the importance of engineering in the world, and usually with some contacts for potential graduate studies, and with a sense of "well, that was fun."

GRE and FE preparation are another item that is voluntary but encouraged. For seniors, an FE exam prep course is made available, along with study guides and SEECS pays for FE exam fees. Students are encouraged to take the exam to have an extra bullet point on their resume. Likewise, for students seeking additional full-time schooling post-graduation, GRE prep and exam fees are provided. Note that there is a high percentage (50%) of "not applicable" responses to the FE/GRE questions. One written comment indicated that an alum thought the FE prep was the most effective SEECS contribution to success, and one comment indicated that the FE should be stressed more. There was, on the other hand, one comment indicating that the FE is overly stressed for ECE majors. As with additional academic advising, this topic should be considered further. We will likely continue to offer these voluntarily.

Activity number 3: SEECS weekly seminar

This is a catch-all category, as it is within the seminar that all other professional development activities are included. Some such as field trips and conferences and social events are performed outside the timeslot of the seminar, but all are included as seminar activities. Thus, this question might best be read as an overall evaluation of the SEECS activities.

Alumni views of the overall effectiveness of the seminar result in a weighted average Likert score of 5.56, with a relatively high percentage of responses (18.3%) indicating "neutral" or "a little bit ineffective." No written comments were provided about the seminar itself. It is likely that students felt the time was not efficiently utilized (hence: a comment about the slow pace of the project, for example) or that the mix of activities is not just as it should be. We will pursue

this further; there was no question included in this survey that probed whether the mix of activities was appropriate, only questions about the individual activities.

Regardless, the seminar activity will continue; it is a fundamental piece of the SEECS program and is written directly into the approved grant proposal. Further consideration of how to emphasize activities and create an effective mix of activities is the next logical step in this analysis of student satisfaction.

Results: Personal growth

Personal development activities all share the goal of providing a community of learners who know and, one hopes, like each other and provide support for one another. To this end, the activities tend to be social. Some representative activities: catered group outings to sporting events (namely: Erie SeaWolves baseball and Erie Otters hockey,) group visits to Tall Ships Erie – a biennial flotilla of tall ships from many distant ports to Erie, and more impromptu events such as picnics in the park. These are the first three questions of the Personal Growth section.
The category of personal growth also includes less social items, such as support for student development of emotional intelligence, assessment of personality traits, sessions on improved study skills and time management skills, and stress reduction techniques and resources. These are intended to provide life skills that will encourage these students towards habits that might make them better-than-otherwise enabled to succeed in the workaday world, post-graduation.

Table 2: Survey results for questions related to SEECS personal growth activities (n = 16)

	Please rate the following SEECS activities/events on their effectiveness on your personal growth. 1 through 7 with 7 as most effective	**Strongly agree**						**Strongly disagree**	
		7	**6**	**5**	**4**	**3**	**2**	**1**	**NA**
1	Social events outside Gannon	44%	19%	31%	0%	6%	0%	0%	0%
2	End of semester dinner off campus	44%	25%	19%	0%	0%	0%	0%	13%
3	Bonding with peer SEECS scholars	44%	25%	25%	6%	0%	0%	0%	0%
4	Seminar activities such as emotional intelligence, personality assessment, etc.	31%	13%	25%	13%	13%	0%	0%	6%
5	SEECS weekly snacks	63%	6%	13%	0%	0%	6%	0%	13%

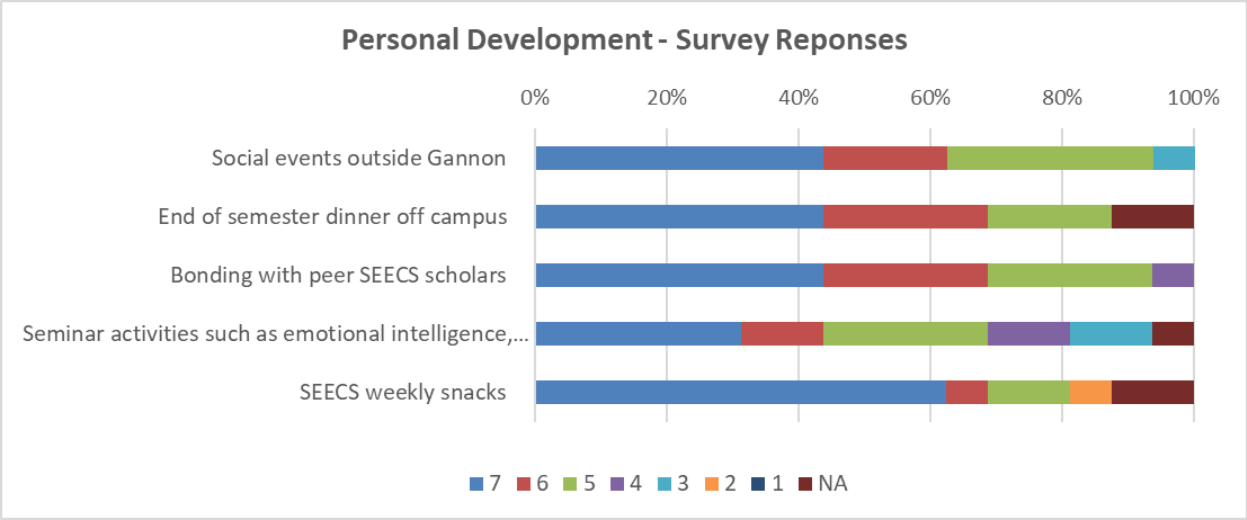

Figure 2: Survey results for questions related to SEECS personal growth activities (n = 16)

Activities 1, 2, 3: Social events outside Gannon, End of semester dinners, Bonding with SEECS scholars

Surveyed alumni were overwhelmingly positive about the effectiveness of outside-class social activities for personal growth. The primary purpose of these events is to build team cohesion – a sense of camaraderie – and thereby provide a ready support group upon which struggling students might call. These events are nominally mandatory, though a certain amount of grace is allowed because these are of course held outside of class time. Typically, if a student cannot attend one of these events, a makeup activity is allowed.

Each semester, on the last Friday before final exam week, SEECS treats all students to a sit-down dinner. In the fall semester, this is done on campus and is paired with student presentations of their design work and some sort of games or entertainment. Project sponsors are invited to see the presentations and weigh in with their thoughts. In the spring, there are no presentations; it is instead a celebration of the end of the year, which includes recognition of graduating seniors who receive an honorific cord and medallion to wear with their commencement robes. The end-of-year celebration is held at a local restaurant of students' choice (note: Hibachi-style restaurants are a big favorite of our SEECS students.)

In their comments, alumni highlighted the significant impact of social events on their personal growth. Interactions outside the regular classroom setting, particularly through off-campus social events, sports games, and end-of-semester dinners, provided valuable opportunities to connect with peers from different years and majors. It was also mentioned that the sense of community was enhanced by SEECS groups, with acknowledgment that bonding experiences varied based on personalities. Despite the diversity in individual preferences, there was a consensus that SEECS effectively fostered a supportive environment, allowing for organic peer bonding and knowledge expansion through interdisciplinary conversations. The importance of social events in building a strong community within SEECS was a recurring theme, fostering friendships beyond project groups and promoting a positive atmosphere for personal development.

Activities 4, 5: Seminar activities such as emotional intelligence, personality assessment, etc. and SEECS weekly snacks

These activities seem not to be particularly well thought of, in terms of effectiveness. Sessions on emotional intelligence, personality assessment and so on are presented by members of the university Student Success Center and are otherwise available to all Gannon students. That is, these activities are mostly not specific to SEECS.

The "weekly snack" seems to provide a welcoming "value added" for most students, and student comments indicate that their inclusion is a positive of the program. More than a "personal growth" item, though, they really serve as a tool to encourage participation; students are happy to have a comforting "gift" to start the class and have expressed disappointment on weeks when the snacks are subpar. We suppose most of us just appreciate a once-a-week treat. It is not clear that snacks contribute to personal growth, and thus we see in the results several results indicating snacks as an ineffective tool for the purpose, but they do seem to serve as a positive mood-setting device for the seminar.

Summary of comments on survey questions

The survey also asked four questions to seek more qualitative comments/inputs from alumni. The questions are listed below along with the response word cloud maps.

Question 1: *In your opinion and through your experience, what SEECS experience (activities/events) contributed the most to your career or professional growth. In particular, please consider activities and events specific to SEECS – not generally offered to all Gannon students*.

Figure 3: Word cloud of the alumni responses for the question about professional development activities.

Working with peers from different engineering disciplines on a community-based design project seems to be the best part of SEECS professional growth activities.

Question 2: *In your opinion and through your experience, what SEECS experience (activities/events) contributed the most to your personal growth. Please feel free to share any examples*.

Figure 4: Word cloud of the alumni responses for the question about personal growth activities.

Interactions with peers from different backgrounds and bonding with peers at social events such as end of semester dinners are the experiences' alumni viewed has had most impact on their personal growth.

Question 3: *What would be your suggestion to improve SEECS experience? What to add and what to remove*?

Figure 5: Word cloud of the alumni responses for the question about suggestions for improvement.

The suggestions for improvement include improving connections with industry and alumni, and addition of activities that would prepare students for careers.

Question 4: *Has your perception of the value of the SEECS experience changed once you graduated? Please feel free to elaborate*.

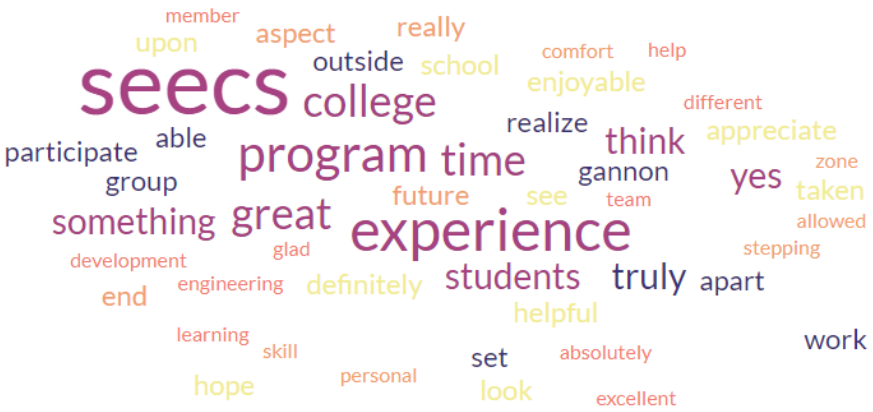

Figure 6: Word cloud of the alumni responses for the question about perception of the value of SEECS experience.

The experiences provided by SEECS program had a greater impact on the personal and professional growth that they realized while in the program.

Concluding Remarks

In summary, the assessment of alumni perceptions regarding the NSF S-STEM grant activities at Gannon University offers valuable insights. Professional development activities like guest speaker series and community service projects received positive feedback, highlighting their role in providing real-world experiences and career preparation. Social events and bonding opportunities were also highly regarded for fostering a supportive community within SEECS. However, activities like mentorship programs and certain personal growth sessions were perceived to be less effective, indicating areas for improvement. Overall, alumni feedback underscores the importance of continuous evaluation and adaptation to ensure the SEECS program remains impactful and relevant for scholarship recipients in their academic and professional journeys.

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