

## **Graduate Students Working Towards an Engineering Education Community: A Case Study of the GT-ASEE Student Chapter**

**Stephanie M. Gillespie and Matthew W. Priddy**

*Georgia Institute of Technology*

### **Abstract**

Graduate students are the future of the engineering education community, as many choose to pursue a career in academia or become industry experts before returning to the classroom. The ASEE Student Chapter at the Georgia Institute of Technology (GT-ASEE) has spent the last four years building a community of graduate students focused on improving the next generation of educators through a three-fold approach: (i) monthly meetings with guest speakers of faculty and staff from across Georgia Tech sharing their innovations in education, (ii) an annual STEM-education research expo with researchers from a variety of departments as well as multiple universities presenting posters, and (iii) an annual teaching and learning workshop for graduate students and post-docs. The purpose of this paper is to share the accomplishments and shortcomings of this approach to help new or younger student chapters succeed.

### **Keywords**

Student chapters, graduate students, future faculty development

### **Introduction**

Graduate students are the pipeline for most faculty positions, with 39% of STEM PhD holders reported as working in academic careers in 2010<sup>1</sup>. One objective of the Student Division of ASEE is “Providing opportunities for students to gain insight into academic careers and teaching practices”<sup>2</sup>. One of the ways to bring these opportunities to college campus is through student chapters. The first ASEE student chapter was founded at Purdue in 1991<sup>3</sup>. Since then, 33 student chapters have been created, 19 of which are active and 7 have been founded since 2012. The 14 non-active chapters indicate that a chapter was present on their campus at one time but has since gone dormant, with no active members or planned events. The large number of dormant student chapters suggests the difficulty many chapters have maintaining an active membership, particularly after the core founding members have graduated. This may be in part due to a culture in which graduate students may be less involved with extracurricular activities and have a less defined graduation timeline than most undergraduate students. GT-ASEE was created in 2011 and within the last year, all of the initial founding members have graduated and/or completed their leadership terms. GT-ASEE is in the process of performing an evaluation of the strengths and areas of improvement for the organization. From this, GT-ASEE hopes to share its perceived successes and shortcomings with other ASEE student chapters for their improved sustainability or ASEE members who are interested in starting a student chapter.

## Creation and Structure

GT-ASEE was founded in summer 2011 by two Georgia Tech graduate students, Dr. Alexandra Coso Strong and Dr. Mary Katherine Watson, to further engineering education research. Both founding members were interested in engineering education research (as opposed to solely engineering education practice), but found that there was little institutional support for the many graduate students interested in engineering education, even while many Georgia Tech faculty were highly involved with ASEE (e.g., past ASEE presidents and JEE editors). All requirements for recognition of GT-ASEE by Georgia Tech and the national ASEE organization were completed during fall 2011; the first meeting was held in November 2011. Dr. Don Giddens spoke to approximately 15 attendees on the scope of engineering education research and practice, while the (proposed) GT-ASEE president and vice-president discussed graduate student involvement in ASEE and other engineering education student groups.

There have been minimal changes to the organizational structure since the founding of GT-ASEE. Officers are elected in the spring every year for the following academic year, with a minimum of four officers (President, Vice President, Secretary, and Treasurer). The organization's constitution allows for flexible leadership options beyond the traditional officer positions through various chair positions. These chair positions can be included or modified according to the needs of the elected officers. In the past, these chair positions have included outreach, membership, webmaster, and social chairs. GT-ASEE considers all officers and chair positions to serve as members of the executive committee. Dr. Wendy C. Newstetter, the Director of Educational Research and Innovation in Georgia Tech's College of Engineering, has remained the faculty advisor since the chapter was founded and continues to meet with the officers to discuss ideas and administrative roles<sup>4</sup>. Annually, GT-ASEE submits all required paperwork to Georgia Tech student government to maintain status as an official chartered student organization. Current members are mostly Ph.D. students with a few M.S. and undergraduate students. As of January 2016, a total of 277 GT-affiliates receive emails about the chapter through the listserv, including previous members, active members, faculty, and staff. The monthly meetings range in attendance from 5-25 students. The other events held by ASEE range in attendance from 60-100 students, post doctoral scholars, faculty, and staff members.

## Mission

The Mission of GT-ASEE is an adaptation of the mission of ASEE's Student Division<sup>2</sup>. Specifically, the mission of GT-ASEE consists of:

1. Providing opportunities for future engineering educators to develop teaching and research skills.
2. Providing STEM undergraduate and graduate students with the opportunity to learn about engineering education research.
3. Assisting and encouraging minorities and women to study and seek careers in the STEM fields
4. Developing relationships with local K-12 schools and aiding them in fostering student interest in engineering.

## Related Organizations at Georgia Tech

Georgia Tech was recently ranked one of the top institutions for engineering in the country<sup>5</sup>. As such, there are over 9,000 undergraduate engineering students and over 4,000 graduate level engineering students from which to recruit potential members<sup>6,7</sup>. Many of these students are involved with other student organizations and/or attend programs sponsored by other divisions or departments. Georgia Tech Career Services hosts programming that discusses the academic job search and preparation. The Center for Education Integrating Science, Mathematics, and Computing (CEISMIC) hosts multiple outreach efforts to the local community through both individual one-day events and year-long immersion programs. While a graduate student teaching certificate was (and still is) offered through the Center for the Enhancement of Teaching and Learning (CETL)<sup>8</sup>, the certificate is comprised of credit-bearing courses, which is not something all graduate students can fit into their schedule. Additionally, Georgia Tech CETL provides introductory TA preparation, teaching workshops, and teaching consultations, among multiple other teaching-related programs and there is a graduate communications certificate offered through the Communication Lab<sup>9</sup>. For this reason, GT-ASEE must balance programming between teaching, research, and job-preparation, all while ensuring that the programming is unique to the needs of the members and not something that is offered by other organizations. By focusing its programming towards the interests of graduate students, GT-ASEE differentiates itself from some of the other organization across campus that may not be able to devote their resources towards directed graduate student programming.

## Programming

GT-ASEE has taken a three-fold approach to providing programming and opportunities for members to interact with Georgia Tech faculty and ASEE:

1. Monthly meetings with presentations/discussions led by GT faculty and staff
2. Annual STEM-education research expo poster exhibition
3. Annual teaching and learning workshop (INSPIRE<sup>2</sup>)

Monthly meetings are held on campus during the fall and spring semesters. Georgia Tech faculty and staff are asked to speak to GT-ASEE members about specific topics related to engineering education in the areas of pedagogy and classroom innovations, engineering education research, or future faculty preparation. The goal of these monthly meetings is to provide a forum for members to discuss various aspects of engineering education. Occasionally, speakers from other universities are available and invited to present at a monthly meeting. These meetings are kept to one hour to reduce the time burden on both the members and the speakers.

The STEM-education research expo is held in early spring and has been held annually since 2013. The purpose of the STEM-education research expo is to bring together education researchers from different departments and colleges at Georgia Tech and other invited institutions while providing attendees the opportunity to learn about the field of STEM education research. Presenters are invited to submit an abstract and poster presenting their work in the field of STEM education; abstracts are reviewed by GT-ASEE officers. In 2015, an effort was made to reach out to other universities in close proximity to Georgia Tech. Students and faculty from Clemson University and Georgia State University were among the presenters and attendees.

Topics presented have included women in engineering, K-12 research, problem-based learning classrooms, and teaching assistant development programs, among others. There have been 30-40 posters at each event with 60-80 attendees joining the discussion. Refreshments and room reservation fees are sponsored by the Georgia Tech College of Engineering.

The Introducing Scholastic and Pedagogical Insight Resulting in Engaged Education (INSPIRE<sup>2</sup>) teaching and learning workshop has been held annually in the summer semester since 2013. The INSPIRE<sup>2</sup> workshop introduces, discusses, and demonstrates the necessary components of an effective learning environment and strategies for implementing various instructional techniques. The emphasis of the event varies from year to year to ensure that attendees who attend multiple years are exposed to new ideas/techniques. In previous years, keynote speakers have included Dr. Michael Prince of Bucknell University and Dr. Damon Williams of Georgia Tech. Dr. Prince is a professor of chemical engineering who has research interests in active and inductive pedagogies, as well as the assessment and repair of student misconceptions; he also leads the Bucknell Project Catalyst: How to Engineer Engineering Education Workshop<sup>10,11</sup>. Dr. Williams is a lecturer in the Industrial and Systems Engineering Department and who has served as the Assistant Director for Education in Georgia Tech Center for Enhancement of Teaching and Learning<sup>12</sup>. Additional sessions, workshops, and roundtable discussions are also part of the event. INSPIRE<sup>2</sup> is free to attend, with a target audience of graduate students and post-docs. Up to 100 attendees participate in each workshop. Although Georgia Tech offers the Tech-To-Teaching certificate program<sup>8</sup>, the classes reach capacity quickly and graduate students are apprehensive to commit due to time constraints. The INSPIRE<sup>2</sup> teaching and learning workshop offers an alternative (or additional) method for exploring ideas like active learning, student expectations, and classroom management. Funding for this event has been provided from the Office of the Provost for Graduate Education and Faculty Development, the Student Government Association, the Center for the Enhancement of Teaching and Learning, and Campus Services BuzzFunds.

Additional programming has included socials at local restaurants, volunteering with local K-12 outreach efforts, and supporting other events on campus that align with the GT-ASEE mission. The frequency of these events is dictated by the involvement of members and the opportunities made available to GT-ASEE.

### **Analysis and Trends**

Both attendees and presenters were asked to complete surveys after the annual STEM-education research expo and INSPIRE<sup>2</sup> teaching and learning workshop starting in 2014. These surveys collect demographic information and event feedback to help GT-ASEE understand the successes and shortcomings of a particular event. This feedback is incorporated into future events to adapt to the ever-evolving climate and student body at Georgia Tech. In general, the feedback on the content, format of the event, and speakers is positive and only minor changes are made between the annual events.

Of interest to the GT-ASEE executive committee was the diversity of the attendees at larger events, specifically the teaching and learning workshop. While demographics were not collected in 2013, Table 1 shows the gender of attendees at the 2014 and 2015 INSPIRE<sup>2</sup> workshops in comparison to the Georgia Tech College of Engineering and College of Science overall graduate

student enrollment<sup>7</sup>. Table 2 shows the race or ethnicity of the attendees as a similar comparison. Important to observe is that Georgia Tech tabulated international students separate from the available ethnicities in their data, while GT-ASEE allowed participants to indicate a specific race or ethnicity or write in their race or ethnicity, which may account for the large difference in ‘Asian’ and ‘N/A, Other, or Unmarked’ between the reported demographics of Georgia Tech and GT-ASEE. For both years of collected data, the GT-ASEE teaching workshop had a higher percentage of female attendees than the graduate student population.

**Table 1: Gender (as percentages) of attendees to annual GT-ASEE teaching workshop in comparison to Georgia Tech College of Engineering and College of Science**

Gender	2014 Teaching Workshop	2015 Teaching Workshop	2014 College of Engineering	2014 College of Science
Female	58.5 %	48.4 %	21.0 %	37.8 %
Male	40.4 %	51.6 %	79.0 %	62.2 %
N/A, Other, or Unmarked	1.1 %	n/a	n/a	n/a

**Table 2: Race/Ethnicity (as percentages) of attendees of annual GT-ASEE teaching workshop in comparison to Georgia Tech College of Engineering and College of Science**

Race/Ethnicity	2014 Teaching Workshop	2015 Teaching Workshop	2014 College of Engineering	2014 College of Science
White	43.6 %	45.1 %	44.0 %	46.3 %
Asian	26.6 %	29.7 %	8.2%	5.0%
Hispanic or Latino	13.8 %	9.9 %	3.8 %	3.8 %
Black or African American	11.7 %	4.4 %	2.2 %	4.4 %
American Indian or Alaska Native	1.1 %	1.1 %	0.1 %	0.1 %
N/A, Other, or Unmarked	4.3 %	9.8 %	41.7 %	40.4 %

From these demographics, it is apparent that GT-ASEE has been successful in promoting the annual events to a diverse group of future educators. One difference to note between the 2014 and 2015 attendee data is that the 2014 workshop was specifically advertised, beyond the standard listserv and College of Engineering/College of Science administrators, to groups serving diverse populations (Latino Organization of Graduate Students, Black Graduate Student Association, and Women in Engineering). This targeted advertising did not occur for the 2015 workshop, resulting in fewer attendees from these groups in respect to both number of attendees and percentage of attendees.

In addition to understanding the impact GT-ASEE has at the larger events, it is important to understand what types of topics would be of particular interest to members for the monthly meetings<sup>13</sup>. The 2015-2016 executive committee suggested ten topics that would (i) be new discussion topics not covered in the previous two years of GT-ASEE meetings or at other events on campus, (ii) be of interest to a variety of members, and (iii) span across the areas of pedagogy

and classroom innovations, engineering education research, or future faculty preparation. The executive committee ranked the ten options and the top choice of ‘teaching to students with learning disabilities’ was chosen as the first meeting topic of the fall 2015 semester. The next seven choices were placed on a ballot. Attendees at the first meeting had the option of ranking their top five choices to help select which topics would be presented for the remainder of the year. Table 3 shows the results after ranking by the ten non-officer members in attendance. The two topics brainstormed by the executive committee that were excluded from the ballot after the first ranking were ‘teaching strategies for K-12’ and ‘VIP (Vertically Integrated Projects) Overview’,<sup>14</sup>.

**Table 3: Preferred meeting topics, as ranked by GT-ASEE members at first meeting of fall 2015. Ranking is best (1) to worst (7)**

<b>Preferred Meeting Topics by Ranking</b>
NSF CAREER Awards- the educational component
Immediate actions to make yourself a marketable academia candidate
Translating lectures to video- effective teaching strategies for video-based classes
Designing program-level assessments
Creating an educational program to promote start-ups
Overview of Georgia Tech Learning Initiatives and Communities
Tour of the video recording center for MOOC development

## Lessons Learned

Most ASEE student chapters recognize the importance of creating a sustainable financial plan to support their chapter activities<sup>15,16</sup>. The teaching and learning workshop and research expo have sponsorship from various organizations and departments across campus. Specifically, GT-ASEE has worked with the Office of the Provost for Graduate Education and Faculty Development, the Student Government Association, the Center for the Enhancement of Teaching and Learning, and Campus Services BuzzFunds to provide funding for the INSPIRE<sup>2</sup> workshop. Additionally, the College of Engineering has sponsored both the teaching and learning workshop and the research expo since inception. This year was the first time GT-ASEE asked the College of Engineering for additional sponsorship to provide food at all of the monthly meetings. In the first two years of GT-ASEE’s inception, the officers supplied food using out-of-pocket expenses. This practice was halted after the cost of the food grew to be a burden on the executive committee, leading to a noticeable decrease in meeting attendance. There has since been an increase in member attendance now that food is provided. Since the events GT-ASEE hosts are annual, the initial partnerships with the sponsoring organizations are maintained year after year, confirmed well in advance of each event, and reports documenting each event’s success and feedback are provided to each sponsor.

One success GT-ASEE has built is the collaborations and campus support from administrators and various departments across the university. This can be attributed to the initial efforts of the founding graduate students to create a broad network of faculty and staff throughout the charter process as well as the personal networks brought by the executive committee members each year. GT-ASEE has multiple affiliates that wish to see the organization succeed and are willing to provide speakers at events, financial support, and mentoring to the GT-ASEE members. In

order to optimize its ability to interact with various faculty and staff, GT-ASEE is working to compile a database of potential speakers, their expertise, and a listing of which previous events they have participated in.

While GT-ASEE has strong collaborations across campus, there is room for improvement with respect to utilizing its network beyond funding and speakers. The bi-weekly newsletter contains information for upcoming GT-ASEE events, job opportunities, volunteer opportunities, and other events across campus that relate to the GT-ASEE mission. However, GT-ASEE officers often find out about other opportunities to include through other listservs. GT-ASEE would like to be an all-inclusive resource for engineering education opportunities. Thus, in the future GT-ASEE will be focusing listserv efforts on ensuring that other organizations and divisions advertise their opportunities that align with the mission of GT-ASEE. Similarly, GT-ASEE can improve the means by which events are advertised through already-existing channels set up by departments and other organizations. The decreased attendance from minority students at the teaching workshop emphasized the importance of sharing information for the larger events with organizations aimed at furthering the interests of students belonging to underrepresented minority populations. While the GT-ASEE listserv is large, every year new members are introduced to the organization when individual departments send out information regarding the teaching workshop every summer. Only with departmental support can GT-ASEE ensure that all graduate students are aware of GT-ASEE and the programs offered.

The most critical challenge GT-ASEE faces is the time constraints already placed on graduate students as the majority members of the organization. The importance of keeping meetings and events concise and on-time ensures that GT-ASEE appreciates the time members take from their day to participate. The teaching workshop was reduced from a two-day event in 2014 to a one-day event in 2015 based on feedback from attendees. It was their opinion that the material presented and discussion, while easily two days worth of material and worthwhile, made it more difficult for them to take time “off” from classes, teaching, and research responsibilities to attend the event. The one-day event was well received by attendees, and only a few commented that they wished the event was a two-day event. GT-ASEE strives to provide programming that is not already offered by other organizations or divisions across campus. This ensures that members will gain new information at every GT-ASEE event they attend.

### **Future Growth**

While GT-ASEE is still in its infancy and attempting to find its place on campus, it can serve as a successful model for similar student-groups across the region. The three-fold approach of monthly meetings, the STEM-education research expo, and the INSPIRE<sup>2</sup> teaching and learning workshop allow GT-ASEE to promote pedagogical practices in respect to both classroom implementation and broader engineering education research efforts. GT-ASEE is working to better understand the needs of student members for the monthly speaker meetings and increase its membership base. While GT-ASEE does not strive to have every Georgia Tech graduate student as a member, GT-ASEE would like all Georgia Tech graduate students to be aware of and utilize GT-ASEE when they have questions or interests in the field of engineering education.

## References

- 1 Turk-Bicaacki, Lori, Berger, Andrea, and Haxton, Clarisse, “The Nonacademic Careers of STEM PhD Holders”, Broadening Participation in STEM Graduate Education, 2014.
- 2 "About", ASEE Student Division: A blog for the students in the American Society for Engineering Education: ASEE Student Division, Accessed 11/12/15, [http://students.asee.org/?page\\_id=2](http://students.asee.org/?page_id=2) .
- 3 "Student chapters", ASEE Student Division: A blog for the students in the American Society for Engineering Education: ASEE Student Division, Accessed 11/12/15, [http://students.asee.org/?page\\_id=102](http://students.asee.org/?page_id=102) .
- 4 “Wendy C. Newstetter,” Center for 21<sup>st</sup> Century University Faculty Listing. Accessed 1/7/2016 at <http://c21u.gatech.edu/team/faculty/newstetter>
- 5 “Georgia Institute of Technology- U.S. News Best Colleges Ranking, 2015,” US News and World Report, Accessed 11/12/2015, <http://colleges.usnews.rankingsandreviews.com/best-colleges/georgia-institute-of-technology-139755/overall-rankings>
- 6 “Undergraduate Enrollment by College, Ethnicity, & Gender – Table 4.14”, Georgia Institute of Technology, accessed 11/29/2015 at <http://factbook.gatech.edu/admissions-and-enrollment/undergraduate-enrollment-by-college-ethnicity-gender/>
- 7 “Graduate Enrollment by College, Ethnicity, & Gender – Table 4.15”, Georgia Institute of Technology, accessed 11/29/2015 at <http://factbook.gatech.edu/admissions-and-enrollment/graduate-enrollment-by-college-ethnicity-gender-table-4-15/>
- 8 Newton, S. H., Utschig, T. T., and Llewellyn, D. C, “A Demographic Analysis of Engineering Majors with an Interest in Teaching,” Paper presented at 2011 Annual Conference & Exposition, Vancouver, BC. <https://peer.asee.org/17314>
- 9 “About,” Graduate Communication Certificate, accessed 1/8/2016 at <http://www.gradcommcert.gatech.edu/wp/>
- 10 “Michael J. Prince,” Bucknell Faculty and Staff Listing. Accessed 1/7/2016 at <https://www.bucknell.edu/college-of-engineering/academic-departments/chemical-engineering/faculty-and-staff/michael-j-prince.html>
- 11 “Project Catalyst: How to Engineer Engineering Education.” Accessed 1/7/2016 at <http://www.bucknell.edu/Catalyst>
- 12 “Damon Williams.” Accessed 1/7/2016 at <https://www.isye.gatech.edu/users/damon-williams>
- 13 Reck, Rebecca, Anastasia Rynearson, and Matthew W. Priddy, “ASEE Student Chapter Longevity and Programming,” 122<sup>nd</sup> ASEE Annual Conference and Exposition Proceedings, 2015, 26.236.1
- 14 “VIP: Vertically Integrated Projects Program,” accessed 1/8/2016 at <http://www.vip.gatech.edu/>
- 15 Matsumoto, E., Jaramillo, N., Vogler, T., Tumer, I. Y., Barr, R., Arthur, L. F., Gray, J., and Serpas, F., “How To Start An ASEE Student Chapter,” Paper presented at 1997 Annual Conference, Milwaukee, Wisconsin. <https://peer.asee.org/6597>
- 16 Chan, Elaine R., Sean P. Holleran, and Alan J. H. McGaughey, “ASEE Student Chapters: Avenues For Promoting Future Engineering Educators,” Paper presented at 2004 Annual Conference, Salt Lake City, Utah. <https://peer.asee.org/12980>



**Stephanie M. Gillespie**

Stephanie M. Gillespie is an Electrical Engineering Ph.D. Student at Georgia Tech. She is the current GT-ASEE student chapter president and has been involved with GT-ASEE since 2012 after finishing her BSEE at the University of Miami. Her research interests focus on speech analysis for language disorders as they relate to stress and depression. Her future aspirations include becoming a faculty member and focusing her research on classroom and program-level techniques for student retention.

**Matthew W. Priddy**

Matthew W. Priddy is a Ph.D. Candidate in Mechanical Engineering at the Georgia Institute of Technology. He completed his B.S. and M.S. in Civil Engineering at Mississippi State University in 2008 and 2010, respectively. He has been involved with GT-ASEE since 2012, holding positions as Secretary (2012-13), Vice-President (2013-14), and President (2014-15). His research interests include computational solid mechanics and lightweight metals, specifically microstructure-sensitive materials modeling and design. He also has an interest in engineering education research, particularly in future faculty development.