



AMERICAN SOCIETY FOR ENGINEERING EDUCATION

ANNUAL REPORT

OCTOBER 2013 - SEPTEMBER 2014

PRESIDENT'S LETTER



It was an honor and a privilege to serve as ASEE president during the 2013-14 year.

One of the true pleasures of serving as president is getting to better know your ASEE colleagues in the president's "line," to see them at work, and to learn of their particular passion for ASEE. The commitment to serve in this role is for three years – as president-elect, president, and immediate past-president.

I've thus had the honor of serving with Don Giddens, Walt Buchanan, Nick Altiero, and now Joe Rencis. It has been most interesting to observe how these individuals work together for the benefit of the Society.

When Don came into office, he identified a strategic objective to pursue as ASEE president, saying, "If I could sum up a long-range objective, it might be with the phrase, 'What does ASEE think?' By this, I mean that I'd like to see our organization move into such a strong and well-recognized position in areas related to engineering education that when issues and opportunities arise, people and other organizations ask: What does ASEE think?"

As ASEE president, Walt was a strong advocate for STEM education and a true believer in the importance of community colleges as a pathway to bachelor's programs in engineering and engineering technology. He was concerned about the cost of education. Walt said, "With student debt now higher than credit card debt in the United States, it is imperative that we, as a country, deal with the rising cost of higher education. One way is to encourage students to start their academic careers at two-year colleges and then transfer to four-year institutions."

When I wrote my candidate's statement, I said, "If selected to serve you as ASEE president-elect, I will focus my energies in two principal areas: public advocacy for engineering and engineering technology education and the 'value proposition' for membership in ASEE.... We must strongly advocate for our students and for engineering and engineering technology education with decision makers in academia, industry, and government. ASEE leadership must continually strive to build public understanding and support and to beneficially affect public policy as it relates to our academic enterprise."

Nick's letter in the September 2014 *Prism* reads, "ASEE is about to embark on a process called *Strategic Doing* to bring further clarity to the mission, objectives, and measures of success of our organization and to focus us on what we can and must do together as an organization. Additionally, ASEE must be viewed as the authoritative orga-

nization on matters pertaining to all levels of engineering education and the organization that informs public policy and guides decision makers on engineering education matters."

Of note above is the common thread of support, concern, and commitment for ASEE to serve its membership and play a critical national role in engineering and engineering technology education in our country.

We have much to be positive about from the past year. Indianapolis provided an excellent venue for our 2014 ASEE Annual Conference and Exposition. For me, introducing Mitch Daniels, president of Purdue University and ex-governor of Indiana, as the keynote speaker at the Monday plenary was a highlight. In addition, I had the pleasure of presenting the 2014 ASEE President's Award to Dr. Ioannis Miaoulis and the National Center for Technological Literacy at the Museum of Science, Boston. They were honored for their use of print, broadcast, or electronic media to encourage K-12 students to pursue an engineering career, as well as to create public recognition of the critical role that engineering plays in our technology-driven society. It was a special pleasure to emcee the 2014 ASEE Awards Ceremony, where our Society recognized a number of volunteers for their service to ASEE, introduced the newest class of ASEE fellows, and honored a number of our outstanding ASEE members with well-deserved awards.

Throughout the year, it was my privilege to attend as ASEE president various events, such as section and zone meetings, and to hear firsthand from you, our members. These opportunities to meet and to share ideas and insights with colleagues are at the heart of ASEE. We are a volunteer professional society, and these activities would not be successful without terrific, dedicated volunteers.

Diversity continues to be centrally important to ASEE activities. The ASEE Board authorized 2014-15 as the "Year of ACTION on Diversity." With input from ASEE's very active Diversity Committee, the intent is for members to discuss, engage, and highlight individual and collective activities that serve to advance the Society's efforts on diversity and inclusivity. Demographics in the United States are changing; it is imperative that underrepresented groups see engineering as a viable career choice and bring their talent into the engineering workforce. On this topic, you may wish to read the 2014 ASEE-National Academy of Engineering report, *Surmounting the Barriers: Ethnic Diversity in Engineering Education* (asee.org/Surmounting_the_Barriers.pdf).

With support from the National Science Foundation, ASEE held the first of what is anticipated to be a series of meetings entitled Transforming Undergraduate Education in Engineering (TUEE) to develop a new strategy to meet the needs of industry in the 21st century. Read more details in the Outreach and Engagement section on page 52.

ASEE leads in many other efforts aimed at supporting and improving engineering education. In K-12, ASEE sponsors an annual K-12 workshop, the *Engineering, Go for It* website, and resources for K-12 teacher professional development. ASEE's work to understand retention challenges and to improve retention and graduation rates of engineering students has drawn praise from many, including President Obama. The report, *Going the Distance: Best Practices and Strategies for Retaining Engineering, Engineering Technology and Computing Students* is on the

ASEE website (asee.org/retention-project). ASEE also provides the definitive source of data on engineering programs with the *Profiles of Engineering and Engineering Technology Colleges*. This is an invaluable resource for engineering administrators and others seeking authoritative data.

We are fortunate to have dedicated ASEE staff members serving the membership and making ASEE an influential, relevant society. They are dedicated to providing quality services for members, whether it is at conferences and workshops, via *Prism* magazine, managing fellowship and research opportunities for both students and faculty, or a myriad of other activities.

I have greatly enjoyed my time working with the ASEE Executive Committee, Executive Director Norman Fortenberry, the ASEE staff, and ASEE Board members during my year as president. It is an important time for engineering education in our country. ASEE is making significant contributions and has the potential for an even more influential role going forward. We all must sharpen our focus on keeping ASEE positioned as a forward-looking organization supporting and serving engineering education and the careers of engineering and engineering technology faculty.

- Kenneth F. Galloway

EXECUTIVE DIRECTOR'S LETTER



Fiscal year 2013-14 began with the Society's membership expressing its full-throated support for our commitment to diversity and inclusion across demographic categories and characteristics and culminated in the declaration of Society Year 2014-15 as the Year of Action on Diversity.

The diversity effort was jump-started with a September 2013 workshop on surmounting barriers to diversity in engineering and highlighted with a series of 12 SafeZone training sessions at the 2014 ASEE Annual Conference and Exposition. As referenced in Ken Galloway's letter on the previous page, the Society's commitment to diversity and inclusion was also reflected in our outreach and engagement with various constituencies. We sought the advice of employers on the desired outcome characteristics of engineering students, published a report on how we might transition returning veterans into engineering and engineering technology careers, and offered assistance to the government of Chile on assessing innovative approaches to engineering education that promote economic development (see <http://jamesladams.typepad.com/blog/2014/03/chile-and-engineering-education.html>). We also commented on and have remained engaged in discussions about how engineering and engineering technology can provide a useful framework for the pre-college study of math and science. In short, we confirmed our belief that diversity and inclusion are not what we do to benefit others but what we do to enrich, enable, and empower ourselves to be more effective in accomplishing our mission.

ASEE's staff is second to none and works tirelessly to serve you, our members, ever more efficiently and ever more effectively. We enhance ASEE's reach and representativeness by actively recruiting individual and institutional members from across the academic spectrum. Within the strategic guidance set by the board we raise ASEE's prominence and relevance across academic engineering, such that when important issues arise the essential question is, "What does ASEE think?" We keep

you well informed through a variety of print and electronic communications.

ASEE continuously manages its "brand" and how it communicates with various audiences. Part of this consideration is our graphic representation in the form of our logo; while our old logo had served us for many years, it was aesthetically old-fashioned. Thus, after consultation with our Board of Directors and reviewing multiple options provided by our talented art department, ASEE headquarters presented two logos for a vote by our members. Rolled out at the Annual Conference, the new graphic uses sharp lines and modern colors to convey the message of growth through collaboration. In use with the tagline we developed two years ago, it helps strengthen the ASEE brand.

We continue to face a challenging operating environment. Unlike members of other societies, relatively few ASEE members see us as an essential venue for continuing professional education beyond the Annual Conference. Although the national economy is improving, the federal government—a major supporter of our fellowship and research opportunities programs—continues to reduce support for programmatic activities and also inhibits the ability of federal employees to attend our meetings and workshops. In addition, we continue to face legal challenges, but are confident of our eventual victory.

Nonetheless, as you see in both Ken's letter and the pages that follow, there is considerable tangible evidence of the Society's growth and progress across a broad array of activities. Our breadth is not evidence of a lack of focus, however; we remain focused on serving our members and providing you maximum individual benefit through collective professional association.

- Norman Fortenberry

MEMBERSHIP

As the premier society for engineering and engineering technology educators worldwide, ASEE continues its commitment to provide members with resources, information, and services to assist them professionally. The Society strives to keep its members abreast of the latest advancements in technology and innovative teaching methods, and to provide regional and national networking opportunities.

ASEE membership is growing in key areas. Student membership continues to steadily increase from year to year, while the Professional Online membership category has quickly risen to more than 800 members. K-12 membership has sustained momentum from last year, with well over 200 members.

INDIVIDUAL MEMBERSHIP

	2010	2011	2012	2013	2014
Total Professional	9,246	8,703	8,944	9,009	8,471
Total Contact	1,299	1,364	1,527	1,522	1,454
Life	719	702	672	675	677
Retired	546	498	476	460	436
Student	728	796	826	770	786
K-12	129	145	170	221	224
Global	847	855	112	32	1
Total	13,514	13,063	12,727	12,689	12,049

INSTITUTIONAL MEMBERSHIP

	2010	2011	2012	2013	2014
Engineering College	323	310	313	319	322
Engineering Technology College	94	89	89	88	88
Affiliate College	36	34	30	26	22
Canadian	16	16	16	16	21
Non-U.S./Canadian	17	15	14	14	13
K-12 School Membership	6	3	3	4	5
Academic Total	492	467	465	467	471
Corporate/Government/Association	147	141	164	144	105
Grand Total	639	608	629	611	576

CONFERENCES

The opportunity to network and connect regularly with professional peers ranks among the best benefits of ASEE membership. In 2014 our premier event, the ASEE Annual Conference and Exposition, was held in Indianapolis and allowed attendees to participate in numerous activities, from social events to professionally enriching paper sessions. For the first time, ASEE assembled high school-age winners of national STEM-focused competitions for recognition and a Q&A session. In addition to this, the approximately 3,700 conference participants enjoyed events like the division mixer, 350 technical sessions, and professional interest-specific division meetings. The conference featured more than 1,400 published papers and 140 business meetings and drew 116 exhibiting companies and 35 sponsoring companies. Numerous attendees won prizes via a real-time social media contest.

In addition to the annual conference, staff supported several other high-profile events during the year, including the:

- Engineering Deans Institute
- Engineering Technology Leadership Institute
- Engineering Research Council Meeting
- Public Policy Colloquium
- National Effective Teaching Institute
- ASEE Workshop on K-12 Engineering Education
- ASEE International Forum
- Various other meetings ASEE manages for entities such as the National Science Foundation and the Department of Energy

FELLOW SPOTLIGHT

TANYA CRUZ GARZA

PAIRING A HIGH FLIER WITH A START-UP



My passion for engineering began as a passion for space. Fascination with the Apollo and space shuttle programs drew me to aerospace engineering, and I ultimately earned my bachelor's, master's, and Ph.D. in the discipline from MIT (home to the top aerospace engineering program in the country).

My master's work studied the use of microfabrication plasma treatments to improve propellant wettability on electrospray propulsion thrusters. My Ph.D. work continued in the area of microfabrication process development but this time dealt with microfabricated high-pressure vessels for small launch vehicles. A great deal of my background has been focused on using microfabrication for innovation.

My interest in space also piqued my interest in learning more about start-ups, which are causing major shifts in the space industry. My background made me a good fit for Chromation, where I received an ASEE-NSF Industrial Postdoctoral Fellowship to develop new nano-fabrication processes for photonic crystal spectral sensors. During

my time at Chromation I developed a process to scale up the production of photonic crystal structures for visible and ultraviolet applications. I have also developed microfabrication techniques for novel materials such as sodium chloride and calcium fluoride for infrared photonic crystals. In addition to my process development work, I have had the opportunity to get involved in technical reports and presentations, as well as business development by giving pitches, meeting with potential customers, and representing the company at a number of trade shows, including the 2013 and 2014 International Consumer Electronics Show. Working for Chromation through the fellowship program has given me a unique opportunity to apply my academic skills to problem solving in a commercial context and learn about different aspects of start-up operation.

Tanya Cruz Garza was in the NSF Small Business Innovation Research Program.

ANNUAL CONFERENCE (REGISTRATION TOTAL)

2010	2011	2012	2013	2014
3,248	3,832	3,751	3,758	3,623

INTERNATIONAL FORUM (REGISTRATION TOTAL)

	2010	2011	2012	2013	2014
ASEE Global Colloquium	405	NA	NA	NA	NA
ASEE Global Symposium	NA	106	NA	NA	NA
International Forum	NA	NA	112	143	93

Our annual international meeting changed name and format starting in 2011.

OUTREACH AND ENGAGEMENT

With growing awareness of the importance of quality engineering education at all levels, more entities are seeking a relationship with ASEE, expanding our opportunity for influence and contributions. In FY 2014 we engaged with the National Science Foundation (NSF), the Sloan Foundation, the Department of Energy, FIRST Robotics, the USA Science and Engineering Festival, the League for Innovation in the Community College, and the American Association of Community Colleges.

Two important efforts ASEE managed for NSF include I-Corps for Learning (ICL) and the Virtual Communities of Practice (VCP) project. ICL aims to develop an entrepreneurial mind-set within the education community and to have an impact on the way innovations are designed and implemented. The VCP project engages a group of educators online and builds on existing face-to-face faculty development models, engaging community of practice models, and rapidly developing web-based social networking and content management tools. Each of these programs successfully involved an initial cohort in FY 14, with more planned in the coming year.

As mentioned in the president's letter, our Transforming Undergraduate Education in Engineering (TUEE) project seeks to shape future students to meet market demand. An initial two-day workshop assembled representatives from industry and academia to explore the knowledge, skills, and abilities needed by today's graduates. A report

of the first TUEE workshop, Phase I: *Synthesizing and Integrating Industry Perspectives*, is available on the ASEE website ([asee.org/TUEE_PhaseI_WorkshopReport.pdf](http://www.asee.org/TUEE_PhaseI_WorkshopReport.pdf)). Future meetings, each with a different stakeholder focus, are planned.

Our project on Transitioning Veterans into Engineering-Related Careers released a second report in FY 14, the summary of the second workshop ASEE hosted. The report, found here (http://www.asee.org/Transitioning_Veterans_to_Engineering_Related_Careers_Workshop_Report_May_2014.pdf), offers recommendations for creating a successful pathway for vets.



K-12

In 2014, ASEE held its 11th annual K-12 Workshop the Saturday prior to the Annual Conference in Indianapolis. This year the workshop attracted almost 300 attendees for an intense, all-day session of hands-on learning activities and targeted curricular instruction. The workshop continues to grow and be a successful outreach effort for ASEE into the K-12 community.

ASEE had a presence at the annual USA Science and Engineering Festival in Washington, D.C., in April. At this event, attended by thousands of young people and their parents and teachers, ASEE staff distributed the *eGFI* magazine and presented several hands-on learning activities for teachers to take to their classrooms. Speaking of *eGFI*, ASEE continues to reach a vast audience via the *eGFI* blog, magazine, and social media sites.

ASEE has been deeply involved with the emergence of K-12 en-

gineering education standards, asking, "How will we adequately prepare and support the educators who will teach engineering in K-12 classrooms, many of whom have no experience in engineering?" In 2012, motivated by a belief that the professional preparation and development of these teachers should be guided by well-reasoned and research-based standards, ASEE members Cheryl Farmer and Louis Nadelson launched what would become a national effort to define *Standards for Professional Development for K-12 Teachers of Engineering*. In 2014 ASEE published a comprehensive description of the professional preparation and development required to fully prepare teachers of engineering and a matrix for evaluating a given program for teacher preparation or professional development. It can be found at <http://www.asee.org/conferences-and-events/outreach/egfi-program/k12-teacher-professional-development>.

	2010	2011	2012	2013	2014
Workshop on K-12 Engineering Education	298	202	303	249	284

ASSESSMENT, EVALUATION, AND INSTITUTIONAL RESEARCH

The Department of Assessment, Evaluation & Institutional Research (AEIR) continued to expand its work in FY 2014 on external projects, including evaluation of the NSF-funded Engineering Innovation Fellowship Program, evaluation of the NSF-funded Small Business Postdoctoral Research Diversity Fellowship program, evaluation of the NSF-funded STEP Central project, coordination and research for the NSF Ideas Labs meetings pilot, evaluation of the Department of Labor-funded Transportation Academy at the University of the District of Columbia, and data analysis and report

writing for the Aspen Institute's Gates Foundation-funded *Univision Es El Momento* campaign.

AEIR also provided data collection support and analysis for ASEE meetings via post-meeting evaluations and provided technical and analytic support to the ASEE member needs assessment. AEIR continues to produce *Profiles of Engineering and Engineering Technology Colleges*, the nation's premier source for data on engineering and engineering technology education, in addition to a faculty salary survey and an engineering student retention survey.

JOURNAL OF ENGINEERING EDUCATION

The *Journal of Engineering Education* is widely recognized as the premier journal for scholarly research on engineering education. Published quarterly, the journal receives about 300 new submissions each year from authors in more than 40 countries. The journal has an international editorial board that coordinates the peer review of manuscripts. ASEE publishes the journal in partnership with John Wiley & Sons, with the generous support of the College of Engineering at the University of Illinois at Urbana-Champaign. The journal published a special issue in April 2014 on the complexities of transforming engineering higher education. The editorial board conducted a survey of subscribers, authors, and readers in the spring of 2014. The survey results, reported in the October 2014 issue of the journal, will inform strategic planning for the future.

ADVANCES IN ENGINEERING EDUCATION

ASEE recognizes the growing number of outstanding, proven engineering education innovations in the peer-reviewed *Advances in Engineering Education (AEE)*, a journal incorporating the creative use of media, including animation, audio, graphics, and video, as a means of enhancing its articles. To date, *AEE* has received almost 600 submissions, with an acceptance rate of approximately 25 percent and an increasing number of submissions coming from around the world. An

issue in 2014 featured articles on Georgia Tech's student-run Innovation Studio, a ten-year ongoing entrepreneurship education program in Spain, and the use of data analytics to identify engineering education networks. Upcoming special issues will include entrepreneurship education, data analytics, flipping the classroom, and the second-/third- year experiences.

INFORMATION TECHNOLOGY

The IT enhancement most visible to members this year was an improved mobile app for use at the annual conference. Attendees were able to see if their colleagues had checked in and send them a message, among other features. There was also an exhibitor list, helping to locate booths in the exhibit hall. Less visible was a significant update of the software platform that supports the membership and conferences database. With the update we ensure a more reliable and maintainable system.

Online panels were successfully performed by the SMART and NDSEG fellowship programs. The systems developed allowed thousands of applications to be evaluated by hundreds of panelists, all via web-based interfaces. Software platform updates also occurred for several fellowship programs, as did ongoing support for their cycle of activities.

Office infrastructure was enhanced by the addition of two virtual machine clusters for production and development, permitting quick response to changing capacity and configuration needs. Wi-Fi coverage was expanded to better cover the entire office at lesser used frequency bands.



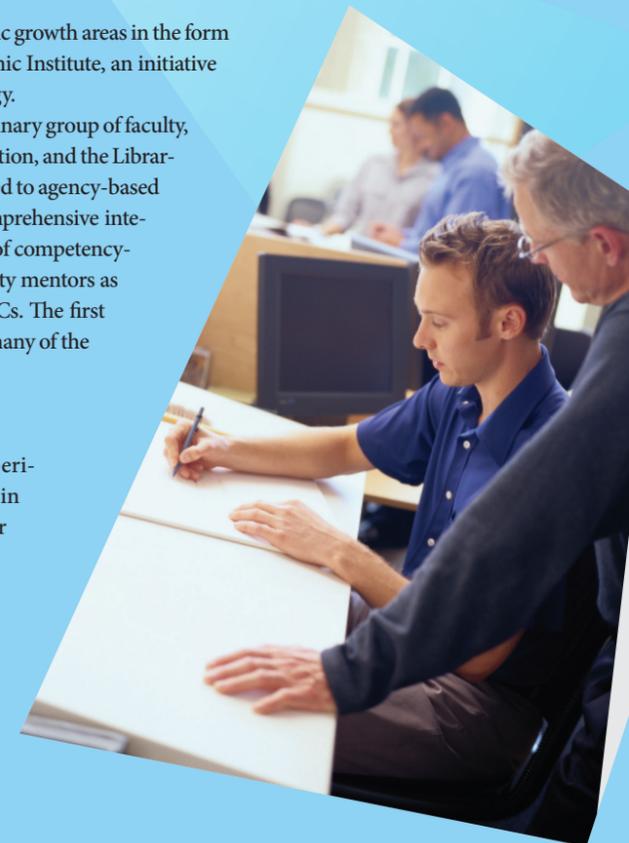
ENGINEERING TECHNOLOGY DEANS' UPDATES

Purdue University, under the leadership of President Mitch Daniels, has set forth strategic growth areas in the form of ten "Big Moves" grouped under four themes, one of which is the Purdue Polytechnic Institute, an initiative that aims to stimulate the transformation of higher education in the College of Technology.

The institute is home to educational research and development driven by a transdisciplinary group of faculty, primarily from the College of Technology but also from the Colleges of Liberal Arts, Education, and the Libraries. The issues researched cover a wide spectrum, including the shift from knowledge-based to agency-based curriculum design; the design of student-centered and student-driven learning; the comprehensive integration of technical competence and the liberal arts and humanities; the implementation of competency-based credentialing to replace the use of credit hours and grades; and the role of the faculty mentors as an integral part of the education process in the age of ubiquitous knowledge and MOOCs. The first by-product of the Purdue Polytechnic is a new transdisciplinary degree that implements many of the researched features. More information can be found at polytechhub.org.

Western Carolina University's engineering and technology programs have experienced tremendous growth in the past few years, primarily due to the programs in engineering and engineering technology adopting project-based learning (PBL) as their core curricula and pedagogy. The PBL approach exposes students to engineering and professional skills upon day one of entering the E and ET programs.

The culmination of the PBL approach is a two-semester interdisciplinary capstone project with regional industries through the Center for Rapid Product Realization, part of the Kimmel School. As part of the PBL curricula, students are exposed to the professional skills identified by business and industry as essential knowledge for entering engineers. The PBL approach is one that prepares graduates to step forward and be productive employees on the first day of employment.



EDITORIAL

ASEE publications sustained a record of award-winning quality while controlling costs and expanding their online presence in FY 2014. The Society's flagship magazine, *Prism*, won 16 awards over the course of the year for cover and interior designs and writing. *Prism* features explored such timely issues as brain research and federal science funding, Ph.D. programs with a new stress on business, and how engineering schools handle the rapid growth of international students. *Prism* also broke ground in coverage of the developing world, reporting on Botswana's decision to train its own engineers instead of sending them to universities in the West. In September 2014, *Prism* launched a redesign with a cleaner, more accessible format.

FY 2014 marked the first full year in which *Prism* was published simultaneously in print and in a password-protected, members-only PDF. A separate online version of the magazine, available to the public, debuted a new, searchable design.

We demonstrated our ongoing efforts to meet members' needs by

assembling a *Prism* editorial advisory board, comprising six distinguished engineering educators and a journalist, under the chairmanship of Debasish Dutta, provost at Purdue.

eGFI for Teachers, one of three ASEE newsletters targeting separate audiences, won a Grand Prize from APEX for its writing on engineering in the Olympics. *The Accelerator*, a newsletter for graduate and undergraduate students, expanded its listings of scholarships, fellowships, and internships while offering regular features. *Capitol Shorts*, a public policy newsletter for deans and department chairs published jointly with the External Affairs department, drew a growing weekly readership both in the United States and some 20 countries overseas.

Collaborating with other departments, the editorial staff reviewed several reports produced by the Outreach and Engagement and Assessment, Evaluation, & Institutional Research departments. Serving ASEE's membership as a whole, the staff also performed the technical work of publishing *Advances in Engineering Education* online.

EXTERNAL AFFAIRS AND PUBLIC POLICY

The introduction of the Next Generation Science Standards, the Revitalizing American Manufacturing Innovation Act, and the reauthorization of No Child Left Behind and the Elementary and Secondary Education Act are all potential influencers of engineering education and areas where ASEE works to have its voice heard.

ASEE is actively involved in multiple STEM-education coalitions, working collectively with peer organizations to educate policymakers. In addition, we make visits to Capitol Hill to meet with congressional staffers and educate legislators on issues important to ASEE members, sign on to letters of support for particular pieces of legislation, and produce *Capitol Shorts*, a weekly, policy-focused newsletter. Each February, ASEE holds its Public Policy Colloquium, strengthening the

discussion of engineering education and research issues between the deans of engineering and key public policymakers. This event gives deans an opportunity to refine their public policy agenda and message, present a unified voice, and meet with individual members of Congress. Three other key events serve an important purpose in this realm: The Engineering Research Council meeting informs members of federal research trends and opportunities; the Engineering Deans Institute meeting allows deans to discuss crucial issues facing their schools, colleges, and profession; and the International Forum provides a significant international opportunity for ASEE members as part of the Annual Conference.

	2010	2011	2012	2013	2014
Engineering Deans Council Public Policy Colloquium	110	126	129	125	114
Engineering Research Council Meeting	128	122	142	126	117
Engineering Deans Institute	NA	200	196	211	183

FELLOWSHIPS

Since the 1960s ASEE has managed a growing portfolio of fellowships and internships – designed for both students and faculty – for the federal government, working primarily with the Department of Defense, the National Science Foundation, and NASA. In addition to strengthening ASEE’s relationship with important constituents, these programs

affect engineering education by creating a larger pool of potential faculty members and providing existing faculty and students with professional development opportunities. In addition, such efforts improve national security by creating a stronger defense establishment and a better workforce. In FY 2014, ASEE managed 6,510 individual fellowships.

	2010	2011	2012	2013	2014
High School Students	226	244	268	2,449	2,490
Undergraduate Students	510	573	477	447	804
Graduate Students	3,362	3362	3204	2914	3,033
Post-Docs	92	67	64	76	86
Faculty	207	232	188	99	97
Total	4,397	4,478	4,201	5,985	6,510