If I'm going to work in industry, why join ASEE???

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Abstract:

One challenge to sustaining ASEE student chapters is finding enough interested parties to participate. There are many thoughts on how to increase potential membership, including catering to undergraduate and graduate students planning to pursue industry positions. This paper serves as a sort of business case for students not specifically planning an academic career to participate in ASEE and become better educators. Based on nine years of industry experience, the author will provide perspectives on what aspects of teaching are of particular use and value in industry roles.

Motivation:

It has been made somewhat obvious by the number of now dormant student sections that getting a critical mass of membership is a challenge. Considering that less than 60% of engineering graduate students obtain doctoral degrees, and less than 30% of them obtain academic positions, catering to only the core of those students intending academic careers ignores more than 80% of the overall engineering graduate population which could benefit from the concepts with which ASEE deals.[1-4] The goal of this paper is to point out the many bankable industry skills that ASEE involvement develops or affects.

Engineering industry career stages in a nutshell:

Industry roles for engineers may generally be divided into five main classifications as shown in Figure 1: developing engineer (less than five years of working experience), engineer (5 to 15 years of experience), technical specialist (more than 10 years of experience), group leader (more than 10 years of experience), and manager (more than 10 years of experience). Many companies, especially the large ones, have multiple career paths which encompass these epochs. Boeing, for instance, offers three paths beginning typically at the group leader stage: engineering generalist, technical specialist, or manager. Obviously, time in any one stage is highly dependent upon the engineer involved.

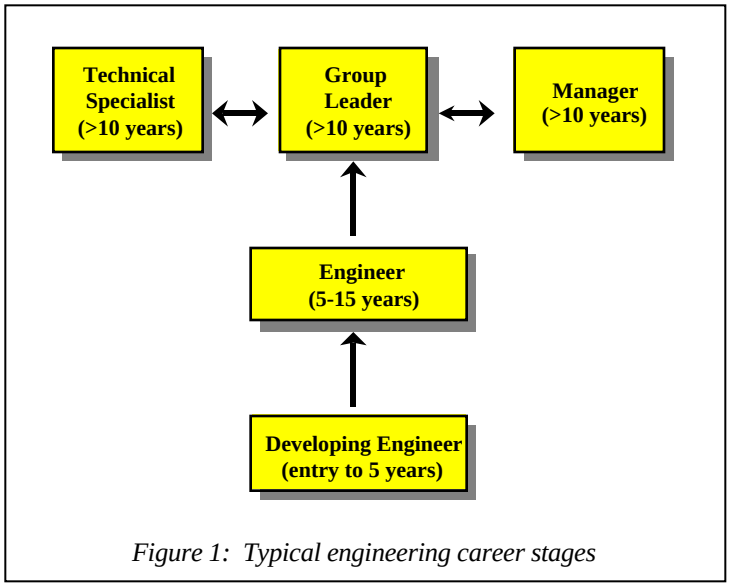

Figure 1: Typical engineering career stages

The **developing engineer (DE)** is primarily self-focused, trying to learn company processes and procedures while building a reputation as a solid performer. He must try to incorporate his recent

education into the assigned tasks. The developing engineer's work is generally closely supervised by other engineers in the group, and he begins to form a set of contacts as technical or professional resources.

The **engineer (EN)** begins to help direct the tasks of developing engineers, and thus must be able to efficiently teach them how to do things. Engineers are expected to be more autonomous workers than developing engineers, with the idea that they can network independently with others to find solutions to problems as needed. Engineers are often encouraged to continue their formal training by pursuing higher degrees and staying current on the latest technological process trends. They may also be involved in cross-training to other disciplines.

The **technical specialist (TS)** develops the processes and best practices for the rest of the group to use, and thus must be able to clearly communicate not only how to do things but also establish the reasoning behind it. They are often sought to solve difficult technical problems. Technical specialists are highly encouraged to present their work at professional conferences, and network with others in the forefront of their area of technological expertise.

The **group leader (GL)**, as one would guess from the name, assumes responsibility for the entire group's output. As such, the group leader must be able to assess the strengths and weaknesses of each group member and balance the assignment of tasks to each member's abilities. In many respects the group leader assumes the technical management of the group, and thus remains a networking resource for others. Initial training in management skills may also be provided if the group leader is interested in pursuing this career path.

The **manager (MR)** assumes the mantle of personnel management of the group and is generally insulated from the technical concerns. He must assess the technical and interpersonal skills for his group, and develop plans not only to take advantage of the group's strengths but also to take action to improve any weaknesses his group members have for their own career development. The manager can affect subordinates' opportunities for cross-training and career development by networking with other managers to secure openings.

How ASEE participation can affect development of industry career skills

Many skills necessary for success in an engineering career are addressed by ASEE activities and publications. By engineering career stage, these are listed in Figure 2.

Skills	DE	EN	TS	GL	MR
Learning	√	√	√	√	√
Networking	√	√	√	√	√
Mentoring	√	√	√	√	√
Teaching		√	√	√	√
Presenting			√	√	√

Figure 2: Required skills for each engineering career stage

The first basic skill is **learning**. This changes throughout a career from being able to learn yourself to being able to assess the learning capabilities of others. Constant in this metamorphosis is the benefit of knowing how people learn, a subject of many publications or presentations for ASEE. By understanding your own learning style, you can minimize the time spent on learning by

optimizing to your best method – this includes asking someone teaching you to present things in a certain manner, which in turn minimizes the man-hours spent training you. Managers love minimizing their training budgets, which are usually stretched extremely thin from the start. Lifelong learning is a major catch-phrase in industry right now, with most companies expecting their employees to continually be involved in learning new methods for their business.

Next comes **networking**. Overall, the most important trait of successful engineers may be the ability to develop a network of contacts both inside and outside of their organization. A rule of thumb in industry is that knowing the answer is not as important as either knowing where to find the answer or knowing someone else who does. ASEE allows participants to make connections at conferences and chapter meetings, if available. These contacts can be among several places of employment and across different engineering disciplines, an added benefit in these times of valuing multi-discipline capability.

Teaching has by far the most direct relation to ASEE, since it is a main focus of the organization. A wealth of published research by ASEE is related to this subject. "Teaching Engineering" graduate-level classes offered at many campuses are greatly affected by ASEE, as many instructors are active ASEE members. In later job stages, gearing instruction according to the instructed ensures getting the best results with the minimum of budget.

Mentoring skills apply to both positions, being a mentor and a mentee. Many ASEE student chapters have mentoring programs with high schools, allowing members to act as mentors. Additionally, graduate students mentor undergraduates and have better access to potential faculty mentors by virtue of common membership in organizations such as ASEE. Mentoring is actually a judged category in application to technical fellowship at Boeing, and can be a factor in skip-level reviews where subordinates rate their group leader.

Presenting skills are most often used in industry when relaying group results to either higher levels of management or to the customer. These skills can be developed by running ASEE student chapter meetings, or participating at meetings. The opportunity to give conference talks also provides additional chances to learn how to present or gain practice at it. Presenting work to others can provide an opportunity to market your own skills and capabilities.

Translating these skills into a better career

The business case for spending time on ASEE activities involves two fronts: monetary, and nonmonetary.

It is often said that no one will become a multimillionaire working as an engineer for an established company, but that does not mean engineers are doomed financially. Employers must keep their workforce at least even with inflation or else employee turnover rates will increase greatly. At Boeing, the "average" raise each year was typically 1% above the annual inflation rate; promoted employees typically got a small boost above that. Assuming that a better initial skill set translates into a better than average rating in each annual review, with a corresponding 0.5% increase in each year's raise over an average of 4%, and promotions a year ahead of the average every five years for the first three promotions and every decade after that, the corresponding salary numbers are shown in Figure 3. Even with these extremely conservative changes from average values, calculating over the course of an entire career shows a 21% overall increase in pay by 40 years of employment.

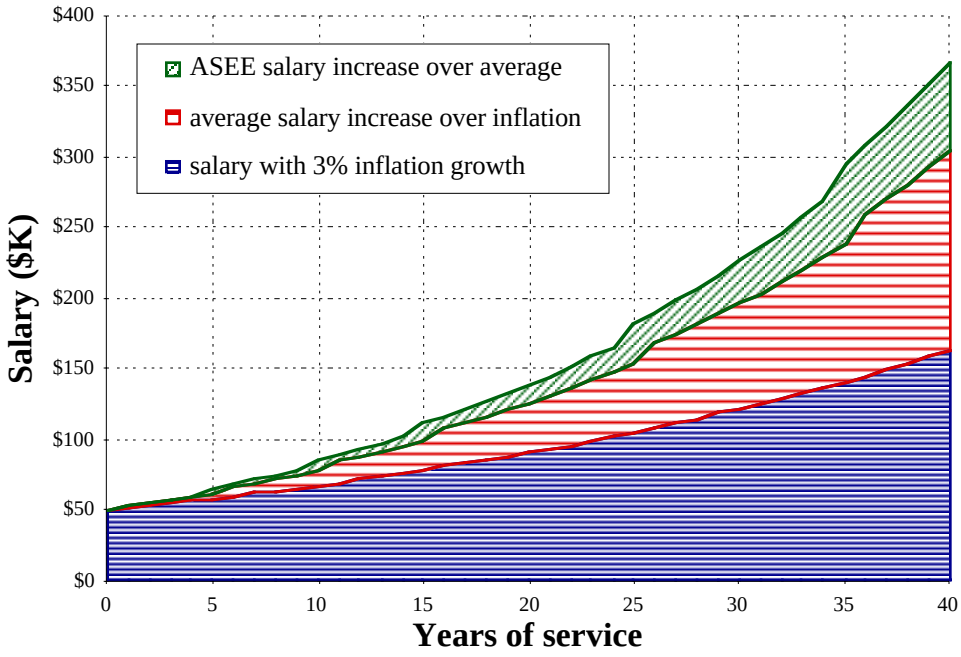

Figure 3: Extrapolation of "average" salary and possible increment due to added skills from ASEE

Success should not only be measured in terms of dollars and cents, though. A great deal of the direction of an engineer's career can be influenced by his work reputation, and someone who is consistently rated highly will get a better choice of work assignments both within and outside of their initial employment firm. This should lead to higher job satisfaction and a higher quality of life, both of which are priceless.

Conclusions

ASEE, through its student chapters and its activities, provides many opportunities to learn, develop, and hone many skills necessary for a successful industry engineering career. Judicious marketing of these benefits can help increase the number of students involved in the organization, both as individual members and in student chapters where available.

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