Engaging Students with Industry through a Student SME Chapter

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Abstract

Student chapters of professional societies have long been a valued part of the undergraduate engineering experience. A student chapter of SME can provide benefits to the involved students and faculty, as well as to local industry and the sponsoring SME chapter students engaged in SME gain linkage to like-minded students, valuable industry contacts, and introduction to a variety of manufacturing industry experiences. Multiple benefits can be derived through engaging students and faculty outside the classroom with industry. Properly leveraged, student chapters of professional societies can help a university enhance student recruitment and retention. Local industry can gain contacts with motivated students who are strong candidates for co-op assignments, internships and full-time employment.

While these benefits can all be achieved, there are challenges, particularly with regard to sustaining the strength of the organization over time. Industry and students are naturally somewhat insulated from one another, and a well-directed effort is required to connect these two distinct groups. This paper outlines the benefits, presents the key characteristics of a vibrant student chapter, and discusses the resources required and the challenges and pitfalls that might be encountered. The paper addresses techniques to develop a successful student chapter of SME including a motivated core of student leaders, engaged faculty in the roles of sponsors and advisors, strong affiliation with a local SME chapter, reasonable student membership fees, and compelling benefits of membership in the student SME chapter.

1. Introduction

The need for engineering graduates with practical skills ready to serve industry has been well-documented. The United States Bureau of Labor Statistics projects that the number of mechanical engineering jobs in the United States will increase by 9% from 2016 to 2026 [1]. In order for United States industry to maintain competitiveness, universities must produce industry-ready graduates at a rate sufficient to replace retiring baby boomers and to meet these growing demands in our rapidly changing world.

The traditional model of theoretical textbook-and-lecture-educated engineers will not meet the needs of employers. Employers can no longer invest substantial time in bringing graduates up to speed. New engineers must come prepared to work on the challenges presented on their first days of work. Engineering schools have implemented many approaches and others are emerging and evolving to produce graduates who are better prepared to address their workplace engineering

challenges from the start. Active learning, entrepreneurially minded learning [2], project-based learning, service learning, and unstructured problem solving [3] are all examples of approaches that go beyond a traditional lecture-homework-review-assessment approach.

A great way to supplement traditional and emerging methods in preparing engineers for the workplace is by early exposure to and engagement with industry. This can be achieved in intern and co-operative education assignments with industry, but not all engineering students have these types of opportunities available to them. Scholar-athletes with busy practice and other team commitments, for example, or students with significant family commitments, or international students who face complicated visa situations might not have co-op or internship opportunities. Even students who do take advantage of industry-based internships and co-op assignments often get a somewhat limited scope based on the type of work with that single employer. All engineering students could benefit from exposure to a wider range of industrial companies.

SME (formerly Society of Manufacturing Engineers) is a non-profit association of professionals, educators, and students committed to promoting and supporting the manufacturing industry. A primary purpose of SME is to facilitate connections among manufacturing professionals [4]. student s can benefit from this network of professionals through membership in an SME student chapter. An engineering undergraduate student who participates in an active SME student chapter can have additional opportunities to engage with a wider range of industrial companies. Well-run SME chapters provide opportunities for industry interactions including guest speakers and manufacturing plant tours.

In the process of researching best practices to re-establish the University of Dayton SME Student Chapter, the authors spoke with Robert Wolff, professor emeritus of Engineering Technology at the University of Dayton and a former long-term advisor to UD's SME Student Chapter, with Ismail Fidan, PhD, professor of Manufacturing and Engineering Technology at Tennessee Tech University and winner of a 2018 Distinguished Faculty Advisor Award from the SME [5], and Mark Price, director of student chapters at SME headquarters in Dearborn, Michigan. Common elements emerged and are presented as tips and tools for establishing and maintaining a strong SME student chapter. Further, the paper includes a literature review with regard to sustaining successful student chapters of professional organizations, and an articulation of the ways in which a successful SME student chapter can enhance the engineering student's college experience by providing opportunities for engagement with industry.

2. SME Student Chapters

SME supports education and students in several ways. SME supports high school technical educators who promote manufacturing through its Mentorship Program. The SME Education Foundation offers scholarships to children and grandchildren of SME members. Even at the local level, SME local chapters often provide financial support for active student members in a variety of forms. Also, SME provides a discounted student membership for graduate and undergraduate students at technical institutions pursing degrees in manufacturing-related fields. These student memberships can be stand-alone or they can be as part of an SME student chapter. As a member

of an SME student chapter, students can organize and participate in many beneficial activities [6].

SME student chapters can provide opportunities for interactions with manufacturing engineers and leaders from industry. When the Tennessee Tech Student Chapter won SME's 2002 Outstanding Chapter Award, one highlighted factor was the chapter's guest speaker program [7], which brought industry speakers to Tennessee Tech SME Student Chapter meetings. Professor Emeritus Robert Wolff, who served as the University of Dayton SME Student Chapter faculty advisor for over 20 years, highlighted manufacturing plant tours as one of the most significant benefits for the UD SME Student Chapter members. Dayton, Ohio, is an area with tremendous manufacturing facilities, providing many opportunities for both the local and the student chapters.

In addition, an SME student chapter is typically affiliated with a nearby professional chapter of SME. Some affiliated SME professional chapters provide an annual scholarship to one or more of the SME student chapter members. This is a great incentive for an individual to join the student chapter. The SME student chapter can also help eligible students be aware of substantial scholarships available from the international SME Educational Foundation.

Additional benefits for a student to join an SME student chapter are experiential. Each chapter will need students to fill leadership roles in chapter offices such as president, vice-president, secretary, treasurer, and recruitment chair. These leadership roles enhance a student's resume even beyond general membership, whether for an internship, co-op, or full-time employment. Perhaps more importantly, students often develop direct contacts with industrial companies that could supply job leads or references. In addition to the resume-building and networking for job leads, the experience of membership or leadership within an SME student chapter is an experience that will provide opportunities for personal growth and enrichment.

Another benefit is the affiliation with like-minded students with similar interests. Retention in Schools of Engineering is a major issue, and young students who are connected both socially and in meaningful work related to their career interests persist with more success. In their 2003 paper about developing successful student professional chapters, Dr. Fidan and co-author Coral Nocton emphasized that the Tennessee Tech SME Student Chapter strove to be the students' "second home," with the chapter and its members ready to help each other at any time [7]. A highly active student chapter will provide many opportunities for comradery to develop among the members. Members of a student chapter can work together in engineering contests, planning industrial outings, and in activities during an institution's Engineers Week, for example.

3. Success Factors

For the membership in an SME student chapter to benefit the institution's engineering and other manufacturing-related students, the SME student chapter must thrive, not merely exist. What are the factors that lead to a successful SME student chapter? How does a chapter thrive?

In a June-2019, phone interview with the authors, Dr. Ismail Fidan highlighted having a motivated faculty advisor as one of the biggest success factors. Having strong and active student leaders in official roles in the student chapter is also key, but students move on, and new student leaders are needed every year. The faculty advisor can be a mentor to the student leaders to make sure the current student leaders take care of succession planning. Dr. Ismail estimated that he spends an average of approximately 1 hour per week in support of Tennessee Tech's SME Student Chapter.

Of course, the key to a successful succession plan is ongoing recruitment of members and developing some of those new members into student leaders. A motivated faculty advisor can be a strong leader in the recruitment of student members of a professional organization. The American Society for Engineering Education surveyed a cross-section of its student members and found that 62% of their student members learned about the ASEE from a professor or an advisor [8]. While this was a survey of all ASEE student members, not just those affiliated with a student chapter, we can reasonably project that professors and specifically the student chapter faculty advisor is in a position to introduce many students to the professional organization and its student chapter. The faculty advisor is also in a good position to solicit mentions from his faculty colleagues to their students.

At the University of Dayton, the SME student chapter lost its momentum after the retirement of its long-time faculty advisor, Professor Robert L. Wolff. The department did not immediately identify a successor who would apply the energy or leadership provided by Professor Wolff in the preceding decades. As a result, the UD SME Student Chapter became inactive, even though the need was clear. In recent months, the authors have initiated the reactivation of the UD SME Student Chapter and have recruited a new core of student members to begin rebuilding the chapter.

The SME Student Chapter at UD maintained 20 to 40 active members at all times during Prof. Wolff's tenure as faculty advisor. Student chapter success factors highlighted by Prof. Wolff included social activities, manufacturing tours, and interesting guest speakers. Providing these opportunities helped keep current members engaged and interested and were opportunities to recruit new members. The manufacturing tours often attracted 10 to 20 students on each tour.

Dr. Fidan of Tennessee Tech recommended that the faculty advisor utilize resources of the national professional organization. In their 2003 paper, Fidan and Nocton, highlighted local chapter benefits and benefits of student membership of the international SME organization. Specific factors included electronic communications such as a chapter website and email box, opportunities for engineering-related service activities such as judging science fairs, industrial plant tours, guest lectures, chapter parties, and fundraisers [7].

4. Role in Engaging student s with Industry

For multiple reasons, US industries are motivated to help improve the preparedness of engineering and engineering technology college graduates for entering the workplace. First, recruitment of skilled candidates to fill highly technical jobs is currently highly competitive, with

many jobs going unfilled for months [9]. Second, there is a large difference between solving a traditional textbook problem with a known correct answer and addressing a typical open-ended industry challenge or problem with multiple potential answers with varying degrees of "correctness". Engagement of industry in the education of engineering and engineering technology students can help expose industrial companies to potential recruits for upcoming open positions and can help close the experience gap between solving textbook problems and addressing industrial challenges.

A student chapter of a professional engineering organization can help provide a link between the students and industry. This link can include a wide range of activities including

- Guest speakers at chapter meetings
- Chapter tours of industrial companies
- Industry sponsorship of technical contests
- student attendance at the professional chapter meetings and events
- Professional chapter mentoring of student chapter officers

Because the SME is focused on manufacturing in general rather than on a specific industry or engineering discipline, the organization can provide a broader range of opportunities for student engagement. Tours taken by members of the Springfield, Ohio, SME Professional Chapter in 2016 and 2017 included trips to an aircraft component manufacturer, a human tissue processing center, a forklift truck accessory manufacturer, a container and packaging factory, a tool and die shop, and a major motor home assembly plant, among others [10]. This represents the variety of industries with which students can potentially connect as a member of an SME student chapter, especially one that is closely allied with a nearby professional chapter.

If the student chapter faculty advisor is also a member of the nearby professional chapter, she or he could facilitate industry-student engagements in a similar broad range of industries as are represented among the professional chapter members or through the members' professional contacts in other industries and businesses. These engagements can include tours, guest speakers, and attendance at professional conferences and SME professional chapter meetings.

Tours can require more complex logistical planning both at the educational institution and at the company but provide an eyes-on direct look at a manufacturing operation and multiple manufacturing processes. By engaging with an SME professional chapter with strong membership, the SME student chapter advisor and officers have a stronger likelihood of making connections with engineers and managers at a wide range of manufacturing operations.

Tours are more beneficial to engineering students when they include a background presentation by someone at the host facility upon arrival, when the tour guide is an engineer or someone who can provide insights or linkages to engineering courses, and if there is an opportunity for student questions at the end of the visit. The students themselves can enhance the value of their visit by doing some advance research about the host company prior to the tour.

In addition to the knowledge and other benefits gained by the students through the plant tours, the hosting industry and the university itself can benefit. The hosting industry has an opportunity to meet potential future employees and to increase awareness of their company. A university faculty member participating in the tour can make valuable industry contacts. A recent tour by the University of Dayton SME student Chapter resulted in an accepted invitation to an executive at the host company to speak at the university at a professional development seminar for engineering technology juniors on the topic of technical leadership.

In some cases, tours are not feasible, but members of an SME student chapter can benefit from a guest speaker from industry. The logistics of a guest speaker at a chapter meeting are much easier, and students can still gain a substantial insight into the specific industry or manufacturing processes. Elements of a successful guest speaker appearance include the use of photographs and videos more than wordy slides or speeches, providing tie-ins to the students' engineering courses, limited length to facilitate busy schedules, student-convenient scheduling and location, and food or other incentives to enhance student attendance. Both external tours and guest speakers can be used as recruitment events by inviting students who are not yet members.

Technical contests for university students hosted by professional organizations such as SME, the American Society of Mechanical Engineers, and the Society of Automotive Engineers can be helpful to engage, recruit, excite, and retain undergraduate engineers, as well as help prepare undergraduates for their careers as engineering professionals [11]. These contests are also good opportunities for informal active learning and resume-building. The SME student chapter can provide information to its members about upcoming engineering contests for university students. The student chapter can also solicit funding from its affiliated SME professional chapter for contest-related expenses. Many universities, including the University of Dayton, conduct fun and informal contests as part of their Engineers Week celebration [12]. If contest entries are by student organizations, the SME student chapter can enter contests to build the comradery among members and enhance the student members' overall college experience.

Attendance at professional conferences can be one of the highlights of an engineering student's time at the university. While many professional conferences offer deeply discounted student admission, there are always travel and other expenses. An SME student chapter can solicit funding from their affiliated professional chapter if their student chapter funds are not enough to cover the costs associated with members attending a professional conference. During our recent communications, Dr. Ismail indicated that 10 SME student chapter members at Tennessee Tech were able to attend the FABTECH 2018 exposition, funded by a generous donation from their affiliated SME professional chapter. Without this funding, it is unlikely that these students would have benefitted from this experience.

Student chapter members can also learn and benefit from attending a meeting of the affiliated SME professional chapter. In addition to information learned at the meeting, students will have opportunities to network with a wider range of engineers who work at or lead industrial companies who can be potential employers. These potential employers, who attend SME meetings because of the value they place on the organization, are likely to be impressed by the student members' interest in SME meetings.

Ideally, one or more of the members of the affiliated SME professional chapter will take a greater interest in the success of the student chapter and devote time to mentoring the officers of the student chapter. In addition to the direct benefits of the mentoring on the current success of the chapter, this relationship can provide developmental leadership growth in the mentored student.

5. Conclusion

Participation in an SME student chapter can enrich the college experience for a student member and contribute to the student's preparedness for a career in the engineering profession. These benefits will only occur if the SME student chapter is strong and ongoing. Success factors for a strong and ongoing student chapter include the commitment of a dedicated faculty advisor, recruitment of replacement members and a succession plan for student leaders, attractive events for the recruitment and retention of members, affiliation with a nearby SME professional chapter, and the fostering of comradery among the members.

A successful SME student chapter provides an excellent conduit for beneficial student-industry engagement. These engagements can help better prepare the student members for their career in the engineering profession. Activities such as guest speakers at chapter meetings, industrial plant tours, industry sponsorship of student participation in technical contests and conferences, and student attendance at an SME professional chapter meeting are all examples of ways to enhance the students' college experiences and better prepare them to secure employment in engineering and succeed in their careers.

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