

The Collaborative Role of Industry in Supporting STEM Education

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In a recent *New York Times* article, “Is Your Student Prepared for Life?” Ben Carpenter relates that 83 percent of 2014 college seniors did not have a job lined up at graduation.¹ He referenced the 2014 AfterCollege poll, which also reports that only half of the respondents felt that college prepared them for the working world.² Carpenter suggested that “career training” as a four-year course would be valuable to all students. In recent years it has become very clear to educators and parents alike that more collaboration is needed between education and industry to help students successfully transition to a career in the student’s chosen major.

We have a pressing national need for more college graduates to transition into the science-technology-engineering-math (STEM) workplace—especially with many employees reaching retirement age.³ As employers have experienced more difficulty in filling STEM positions, and especially engineering jobs, they have become involved more actively in supporting education and providing feedback on employers’ needs for recruiting STEM talent. This article provides an overview of successful collaborative STEM outreach efforts taken by corporations and then focuses on mentoring related to cooperation education (co-ops) and internships.

Industry’s Collaboration With Education

Industry has supported education both for K-12 school outreach and in collaboratively providing college-level internships and capstone projects. A popular example often given for industry’s STEM outreach and mentoring of students is the FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition. It has grown to inspire and mentor 300,000 youth and is well supported by industry.⁴

As representative of many outreach programs, and directly related to ASQ networking activities, the 2011-2013 ASQ Advancing the STEM Agenda Conferences have shown the commitment of collaboration among industry, government, and education for mentoring students both in schools

and universities. Collaborative efforts that were highlighted at the conferences included the following:

- Raytheon’s Leadership And Science Ensures Results (LASER), an outreach program by Raytheon employees to middle school and high school science classrooms.⁵
- Ford Motor Company’s High School Science and Technology Program, an outreach effort for high school students to learn about careers related to the automotive industry.⁶
- NASA’s Langley Research Center internship program with about 250 interns each year “to inspire and motivate students to complete a degree” in STEM.⁷
- Corporate support of co-ops or internships in collaboration with universities. For instance, the conferences’ sessions described the programs at Grand Valley State University (GVSU) and MIT. GVSU’s engineering integrated co-op program has been recognized nationally as an “exemplar of real-world engineering education.”⁸ MIT’s Undergraduate Practice Opportunities Program (UPOP) mentors MIT undergraduates to prepare for a summer internship in industry. Worth noting is that MIT alumni actively volunteer as mentors in this program.^{9,10}

Internships and Co-ops— Career Success Accelerators

One of the strongest strategies that help college students make the transition to successful careers is through co-op programs and internships. The experience of an internship or co-op benefits the student, employer, and the university. The practice for applying and interviewing for an internship mirrors the skills needed for landing the preferred job for a successful STEM career after graduation. The mentoring provided by the employer encourages the student in his/her learning about the workplace culture and working effectively as a co-op or intern. Chris Plouff, James R. Sebastian chair of cooperative education and education development at GVSU,

has developed a socialization process model for the student co-op experience with five stages from that of an engineering student to being a “work-ready” engineer.¹¹ By looking at the transition from student to co-op/intern to engineering graduate as a complex process with identifiable steps, a college can prepare a student better for the co-op experience and provide better mentoring. This model provides information to support an employer’s effort for implementing a successful co-op/intern experience and possibly lead to successful recruitment of the student upon graduation. The model can be applied to most STEM fields.

MIT refers to the UPOP program as a “career success accelerator.”¹⁰ It is an appropriate term for considering the power and potential of a co-op or internship experience in shaping the career of a STEM student and at the same time motivating the student to complete his/her degree in engineering or technology (rather than shift to a non-STEM degree). In her conference paper, MIT’s UPOP executive director, Susann Luperfoy, explains some of the challenges that students face in transitioning from the college classroom to a successful STEM career. For example, as a college student, the student focuses on individual achievement, whereas in the workplace, the focus is on participation as a team member. (See references 9 and 10 for a more complete discussion.) In the work environment, there is more focus on teamwork and getting the job done. The UPOP program supports students with learning exercises and mentoring that help students develop the needed skill sets as leaders in their careers.

It is important to take into account that current traditional college students belong to Generation Y (often referred to as the millennials). Jan Ferri-Reed suggests three approaches that employers can use to help millennials achieve success in their careers:

- “Give them the big picture.
- “Help them find the ‘me’ in team.
- “Mentor them on career-building behaviors.”¹²

Millennials want to understand the “big picture” of the organization and “how their efforts fit into the overall goals of the organization.” Ferri-Reed suggests that millennial employees may need mentoring on “social expectations, boundaries, limits, or acceptable behaviors” to adjust to their new jobs and careers.

Do Co-ops/Internships Affect Student Retention?

Research evidence supports that corporate mentoring through co-ops/internships leads to improved degree completion and transition to related careers. The University of Washington’s Center for the Advancement of Engineering Education’s survey results firmly suggest that engineering students who had sought co-ops/internships were engaged more in pursuing an engineering career, and the experience contributed to students being less inclined to pursue non-engineering careers.¹³ In addition, in support of co-op experiences increasing student retention, Plouff and Barott reported that in their research at a single university, 92 percent of the students who started a first co-op experience successfully completed three co-op experiences in the last two years of college, graduated in engineering, and were employed in engineering.¹¹

Recommendations

Mentoring helps! We need to view career training during the college years as a mentoring process. University leaders need to evaluate and improve the career planning programs that mentor college students so that they develop the skills to be successful both in their college studies and in their careers. As alumni, thankful graduates will give back to their universities.

Industry wants college graduates to be work-ready, often to be prepared to lead an engineering project. Industry leaders need to scale up internship opportunities for all students—especially in the STEM fields. Internships help retain students in their STEM majors, provide them the knowledge about the work culture and potential careers prior to graduation, and increase the STEM workforce. In recruiting students for internships, consider all the strengths of the applicant, not just the GPA.

Leaders should show co-ops/interns the big picture of the business, stimulating them to consider their companies for future careers, and involving interns in discussions and meetings so they feel engaged. Inspiration and vision are important to communicate.

Finally, recognizing that the transition from college to the workplace is a process, consider using the continuous improvement cycle, quality brainstorming tools, and Lean Six Sigma thinking to improve STEM outreach and co-op/internship programs.

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