
AC 2012-3984: HIGHLY RELEVANT AND PRODUCTIVE COLLABORATIONS BETWEEN INDUSTRIES AND UNIVERSITIES

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Highly Relevant and Productive Collaborations between Industries and Universities

Introduction

Engineering education is enhanced by collaborations between industries and universities that provide a platform for students' internships, research, and development of professional and leadership skills. Universities must continue to take an active role to strengthen and grow these partnerships which provide benefits to all involved. This paper will focus on models established at a medium size Master's I Institution. Gannon University has established programs in collaboration with local industry that have proven to achieve the following objectives: (1) to establish an academia-industry collaborative graduate program and a Graduate Research Program (GRP), (2) to demonstrate the effectiveness of programs as a strategy to build up a talent pool of engineering professionals, and (3) to extend the pipeline for engineering professionals who enter existing leadership programs at local industries.

This paper presents general models by which universities approach these and other types of collaborations. The paper describes the successful methods that have been employed by Gannon University and will explore other methods that can be implemented or adapted in different size institutions.

Types of Collaborations

Traditionally the collaborations between industries and universities revolve around students obtaining internships and full time jobs and faculty securing research projects. These collaborations provide financial resources to universities, students, and faculty members. Additionally, these collaborations provide technical expertise and technical assistance to industries. There are number of other ways in which industries can collaborate with universities. These collaborations can be classified into following categories:

1. Teaching Collaborations
 2. Student Internship Collaborations
 3. Research Collaborations
 4. Service Collaborations
 5. Other collaborations
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1. Teaching Collaborations – This collaboration has been in existence for a long time. Under this collaboration industrial members regularly teach undergraduate and graduate courses at the university as adjunct faculty. This relationship has demonstrated to be especially beneficial to small-to-mid size universities when faculty carry heavy teaching loads and expertise in advance or new topics might not be available in house [1]. Gannon University has taken full advantage of this collaboration. Other teaching collaborations include:

- a. Universities delivering special courses to industries. These courses may include courses such as short courses on special topics, review courses on various subjects, and preparatory courses to prepare for Professional Engineering (PE) examination and Fundamental of Engineering (FE) examination.
 - b. University delivering regular courses to industries at their premises.
 - c. Universities providing training to foreign visitors visiting local industries.
2. Student Internship Collaborations – This is probably the most widely used collaboration between universities and the industries. There are number of ways this collaboration can blossom.
- a. Undergraduate and graduate students are hired by local industries to work part time during regular semesters and full time during summer. This provides an opportunity for industries to evaluate the strengths and weaknesses of each student. Industries use this evaluation to make full time employment offers to graduating students. From students’ point of view, this collaboration provides valuable work experience in addition to financial support to them. Moreover, students are able to evaluate the industries for employment opportunities for a possible industrial fit with their short/long terms goals.
 - b. Industries and universities can collaborate for Graduate Traineeship Program (GTP). Under this collaboration, graduate students work part time during regular semesters and full time during summer. Industries in return provide tuition scholarship and stipend to the students. Students are assigned a mentor by the industry and another by the university. Over the last 23 years this collaboration has been highly successful between Gannon University and a local industry. Over 250 students have participated in this program. 95% have been offered full-time employment after graduation. Sixty five percent of those students remain employed by local industry. Figure 1 presents the distribution of 199 students who have participated from year 2000 to present. Another unique feature of this collaboration is that the majority of the students are offered full time employment by this industry upon graduation at highly competitive salary.
 - c. Industries and universities can collaborate for graduate research program. Under this collaboration, industries assign a project to a faculty member who hires students to work part time on the project throughout the academic year under the supervision of the faculty member. Most of the projects are of short duration lasting around 6 months to a year. Over the last 10 years this collaboration has been highly successful between Gannon University and a local industry. The name of the current program at Gannon University is Graduate Research Program (GRP). To date, 50 graduate students, majoring in electrical engineering and mechanical engineering, have participated in this program, refer to Table 1.

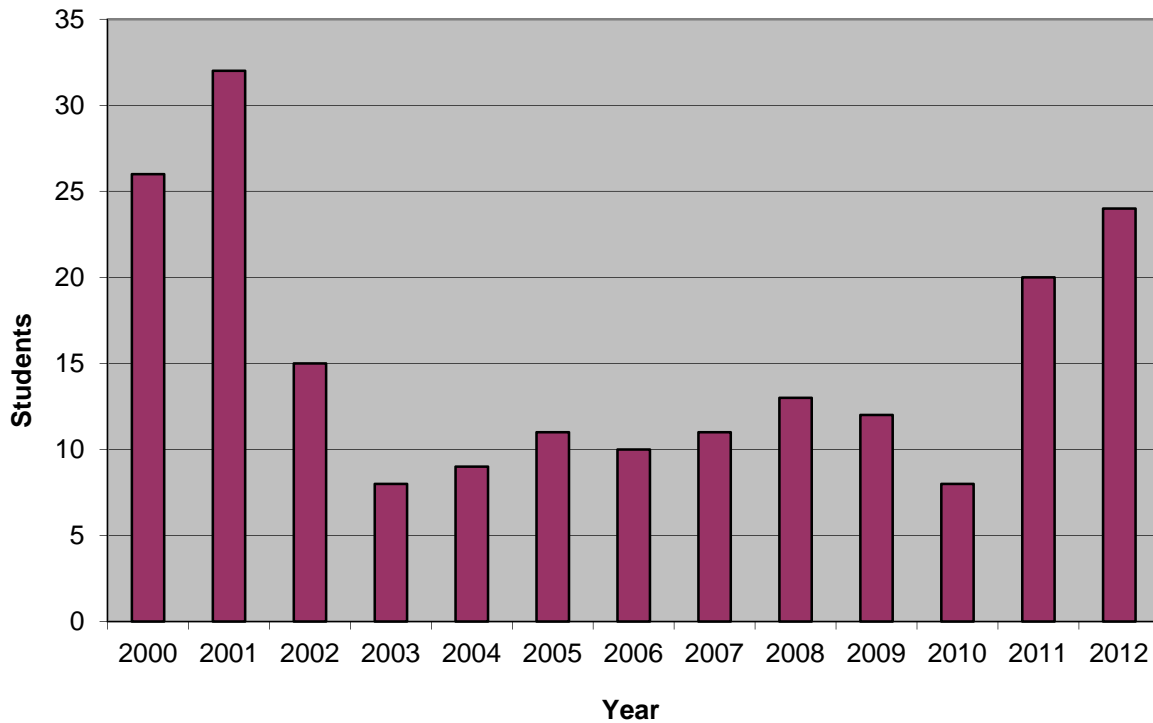


Figure 1: Number of students participating in the GTP during the last 13 years

Table 1: Number of students participating in the GRP during the last 9 years

	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. of students	5	7	6	6	6	5	4	4	7

3. Research Collaborations – Under this collaboration, industries provide funding to universities to conduct specialized research. Industries may not have expertise and or time in house to conduct such research [2 - 4]. The ownership of intellectual property has been an issue in such collaboration and should be carefully resolved before any type of agreement or contract is signed. In another type of collaborations, industries require faculty members to spend time at local industries’ premises to help coordinate and/or conduct research. In these collaborations the ownership of intellectual property is retained by the industries. Over the last 19 years this collaboration has been highly successful between Gannon University and various industries. On average, five to six faculty members are involved in this collaboration. The number of hours per faculty varies from 400 to 1000 hours per year that allows faculty member the possibility of buying release time for teaching.
4. Service Collaborations – This is the type of collaborations that has not been fully explored by industries and universities. A possible explanation could be that most of the burden lies on industries to provide service to the universities. However this collaboration has been highly successful between Gannon University and local

industries. A number of ways in which this collaboration can help universities follows.

- a. Industrial members in high leadership positions could serve on the University Board of Trustees. Typically, this type of service is linked to fundraising requirements.
 - b. Industrial members in high leadership positions could serve on University search committees for President and/or Provost.
 - c. Industrial members in high leadership positions could serve on Engineering Advisory Council. This collaboration is highly desirable given that it results in industrial members input during the development and revision of Program Educational Objectives as defined by ABET, Inc., and during the reshaping of the curriculum of engineering programs. Additionally, the participation of industrial members can help faculty on development committee and student internship committee.
 - d. Industrial members in high administrative positions can serve on University Development Committee.
5. Other collaborations – There are number of other ways that can provide successful collaborations between universities and industries. One such common collaboration involves industries providing speakers and industrial tours to the student sections of professional societies at universities. One of the less explored collaboration involves industries providing equipment to universities on a loan basis in exchange for free training (software and/or equipment) for their employees. Yet another type of collaboration utilizes university and local industries partnership when visiting local middle and high schools as part of outreach activities.

Benefits to industries

As a result of above collaborations, industries will gain the following benefits:

1. It provides opportunities for industries to work with expert faculty to solve complex problems and retain intellectual property rights.
2. It provides opportunities for industries to evaluate the strengths and weaknesses of students before offering the full time employments to them.
3. It provides opportunities for industries to get specialized courses taught by universities.
4. It provides opportunities for industries to get qualified undergraduate/graduate students to fill temporarily positions.
5. It provides opportunities for industries to help universities to develop engineering curriculum according to industries' needs.
6. It provides opportunities for industries to showcase their products and facilities to potential employees (i.e. students) by providing tours and speakers.

Benefits to universities

As a result of above collaborations, universities will gain the following benefits:

1. It provides opportunities for universities to develop specialized non-conventional courses to be taught to industries.
2. It provides opportunities for universities to place their graduates in the industries for full time employment.
3. It provides opportunities for universities to arrange tours and speakers for student sections of professional societies.
4. It provides opportunities for universities to fund research programs using overhead charges obtained from industries.
5. It provides opportunities for universities to obtain help from industries in developing curriculums for various programs.
6. It provides opportunities for universities to help students in obtaining internships.
7. It provides opportunities for universities to obtain research projects.
8. It provides opportunities for universities to get voluntary service on many important universities committees.
9. It provides opportunities for faculty to develop patents and papers for publications.

Conclusions

This paper describes the various ways universities and industries can collaborate to strengthen relationships between industries and universities. Gannon University has employed many of these collaborations for mutual benefits. As a result of these collaborations, faculty has obtained numerous patents, furnished laboratories with modern equipment either through loan or purchased using industrial funding. Students participating in these programs are able to gain valuable work experience and the majority of the students receive full-time employment offers as a result of these interactions.

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