

Fostering Faculty Scholarship and Grantsmanship through Engagement Activities

Mohammad A. Zahraee and Niaz Latif
Purdue University Northwest

Introduction

Purdue University Northwest (PNW) is committed to applied research and community engagement within its metropolitan region. PNW's strategic plan focuses on significant goals on community and regional partnerships. PNW is uniquely equipped to strengthen and enrich its surrounding communities in ways that are mutually beneficial for internal and external stakeholders alike [1]. These mutually beneficial partnerships could be through sponsored capstone projects for engineering technology programs or other technology programs that require culminating experience by its students.

Numerous articles described the benefit of industry sponsored (funded or unfunded) projects that sometimes actively involves industry professionals. Goldberg et al. (2014) described how industry involvement in a multidisciplinary design course benefited both students as well as industry participants. In addition, such involvement by the industry professionals makes the curriculum current and relevant to the discipline [2]. Weissbach, et al. (2017) demonstrated that industry sponsored capstone projects provided immediate and ongoing benefits to sponsor as well as enhanced students learning through experiential knowledge [3]. Similarly, Bachnak and Attaluri (2020) described five specific industry sponsored multidisciplinary projects that augmented classroom learning by students with real life experiences. The authors also described the approaches they had taken to attract such sponsored projects from industry [4].

This paper describes several approaches that have helped the university to be more engaged with the industry and the community, and how these involvements have resulted in increase of faculty scholarships and grantsmanship.

Faculty Internship

The College of Technology has been offering a faculty internship to all new tenure track faculty to encourage and jump start their engagement with local and regional industry. This program helps faculty identify the local/regional industry in the faculty member's field and sets up a three-week internship for the new faculty in their first summer semester. The college pays the faculty for this three-week internship. Following is a sample list of different experiences by faculty over the past three years, as listed by faculty:

- Shadowing a different department each week.
- Travel to different construction sites (for construction management faculty) to tour projects with a lead engineer.

- Working with controls team, engaging in approximately seven distinct projects (for mechatronics faculty) within three weeks.

All faculty going through this internship program have either already integrated elements of their internship into one or more of their courses or are in process of doing so.

Not only is each of them now connected to at least one local/regional industry, their students are also benefitting from faculty experience as they are bringing the latest technology and practices into their classroom. Several undergraduate and graduate research projects have resulted from faculty internship experience as well.

Another important outcome of this initiative has been industry support for faculty grants and industry projects for upper-level courses that faculty teach.

Faculty Semester Release for Engaging with Industry

The College of Technology (COT) has been offering a semester release or summer stipend for those faculty who initiate collaboration with industry. The requirement to receive the first release is a letter from company, stating that they are working with faculty in a collaborative project with no pay to faculty (non-consulting collaboration). For the faculty to receive the second release, the company should submit a request for collaboration along with a monetary commitment to cover the release time for the faculty. For the third and final release to be awarded, not only the condition for the second release must be satisfied, but also at least one student should be engaged in the collaborative project. This release is primarily for new faculty and those who have not been engaged with industry for a period.

The benefits of this initiative have been as follows:

- Two faculty taking advantage of this initiative have started consulting with these companies, bringing their experience into the classroom.
- One faculty and the industry working with him who received the award three times eventually was awarded an NSF FPI grant with the industry as a leading partner for over \$245K over two years. The grant has also supported a graduate student assistantship for two years at twelve months per year, resulting not only in scholarly publications, but also a further supplemental grant that was recently awarded for another \$50K. The faculty has already been able to receive release time to submit an SBIR grant with the collaborating industry.

Industry-Sponsored Student Design Projects

In 2019, through the generous donation from an alum, PNW purchased a 5000 SF space and established the David Roberts Center for Innovation and Design (CID). This center is used to house only industry supported and/or sponsored projects. These projects are all done by students (mostly as their senior design) with faculty as their mentors.

Students, through these projects have applied for and been awarded undergraduate research grants through the Office of Research while working with an industry engineer, producing solutions that have been implemented in company designs and for their customers. These projects have typically been two-semester long. Following is a list of some sample projects:

- a) Designing trainers and demonstration cases for linear motion cylinder industry [5]. This project involved receiving linear motion cylinders along with PLCs from the company and designing a training case for sales employees to use them for demonstration purposes. The goal of the project was to create a simple system that could help demonstrate the capabilities of the company's linear motor systems to showcase how it can be applicable to multiple industries using automation. The system created was contained inside a hard shell case for ease of transport, while maintaining easy access to the PLC and motor drive I/O in the event the configuration was to be changed. Figure 1 shows the final product designed and built by the project team.



Fig. 1. Trainer and demonstration case design for industry.

- b) Performing research to collect data showing the advantage of magnetic linear actuators over hydraulic ones. Students had to design working equipment that used both kinds of actuators for several applications. Perform several experiments on each and collect data, proving the hypothesis that the company actuators were able to outperform the hydraulic ones.
- c) Retrofitting a water purifier which was used for remote areas of developing countries for practicality and ease of use. The students also proved the concept of remote monitoring, data collection, and maintenance for several of those water purifiers at remote locations. Figures 2 and 3 show the actual system in Guatemala and the test system housed at PNW [6].



Fig. 2. Water purification system in Guatemala.



Fig. 3. Water purification test model in CID building at PNW.

- d) A project for a packaging industry partner that deals with improvement of a container handling process with a solution for creating an adjustable escapement assembly (both for the gates and the lanes) to accommodate movement of containers with various diameters. The project involves building a prototype, perform testing and prepare a report.

Figure 4 shows this project along with the two students working on this project and one of their three faculty advisors.



Fig. 4. Students discussing solutions for an adjustable escapement assembly.

It should be noted that several of these projects have been a second project from the same company. As students and faculty have done such an excellent job, the company has decided to come back with more projects.

Over the past three years, this center has produced the following outcomes through the College of Technology:

- Industry sponsored projects funded/unfunded 13
- COT faculty involved with projects 7
- Number of students involved with projects 19
- Number of projects receiving undergraduate research award 5
- Number of publications by faculty and students 8

Innovation and Entrepreneurship through Engagement

PNW leaders are engaged and partnered with area business, industry, as well as several non-profit organizations to foster economic development. Primary areas of focus include economic development through innovation and entrepreneurship. In Northwest Indiana, PNW administrators serve on various leadership roles in regional economic development organization,

*Proceedings of the 2024 Conference for Industry and Education Collaboration
Copyright ©2024, American Society for Engineering Education*

and at service organizations such as Urban League; Legacy Foundation; and United Way. As a result of such partnerships and PNW's commitment to innovation and entrepreneurship, two centers have been established, Center for Commercialization and Manufacturing Excellence (CMEC), and David Roberts Center for Innovation and Design (CID). One of the purposes of CMEC center is to foster innovation in the Northwest Indiana region through commercialization of innovative ideas and products. Further, to scale up such activities, recently PNW has established the impact lab through state and private support. The CMEC produced the following outcome till date by engaging PNW faculty, students, and staff.

College of Technology faculty and students have been engaged with CMEC clients by producing prototypes (39) of innovative products to help with provisional patent applications (40).

Summary

Multi-prong rewarding approaches to faculty engagement with industry have been used to increase faculty scholarship that justify the College of Technology at Purdue University Northwest claim of being the "engagement arm" of the institution. The approaches and initiatives described in this paper have proven to be beneficial to the institution, students, faculty and their scholarship, and the industry.

Benefit to students

- Working directly with practicing engineers to solve problems.
- Receiving an experiential experience unmatched with any classroom teaching
- Receiving offers from companies after completion of their senior project

Benefit to industry

- Having their projects performed at minimal or no cost by students with faculty supervision.
- Collaboration of their engineers and management with university faculty and use of the University facility for applied research

Benefit to faculty

- Being engaged with industry and their projects
- Receiving gift-in-kind equipment for student research
- Improving their scholarship of engagement through:
 - ✓ Publishing the results, where permissible, with their students and industry personnel
 - ✓ Securing federal grants

References

1. <https://www.pnw.edu/leadership/strategic-plan/>

2. Goldberg, J; Cariapa, V; Corliss ,G; and K Kaiser (2014). Benefits of Industry Involvement in Multidisciplinary Capstone Design Courses. Biomedical Engineering Faculty Research and Publications. *International Journal of Engineering Education, Vol. 30 (1), 6-13.*
3. Weissbach, R; Snyder, J; Evans, E; and J Carucci (2017) Industrial Sponsor Perspective on Leveraging Capstone Design Projects to Enhance Their Business. *American Journal of Engineering Education, 8(1), 13-22*
4. Bachnak, R and A. Attaluri (2020) Promoting Multidisciplinary Industry-Sponsored Capstone Projects. *Proceedings of the 2020 ASEE Annual Conference & Exposition, Tampa, Florida.*
5. Mikhail, M (2022) Innovation and Design through Industry Partnerships. *Proceedings of the 2022 ASEE-CIEC Annual Conference, Charleston, South Carolina.*
6. Markovich, M; Fathizadeh, M (2022) Innovation and Design through Industry Partnerships. *Proceedings of the 2022 ASEE-CIEC Annual Conference, Charleston, South Carolina.*