

Implementing and Managing Summer Internships at The Pennsylvania State University, The Behrend College, for Seniors in the Mechanical Engineering Technology Program.

**Fredrick A. Nitterright, David E. Roth, Kenneth Fisher
The Pennsylvania State University, The Behrend College**

Abstract

This past summer completes the second year of summer internships conducted by students in the Mechanical Engineering Technology program at The Pennsylvania State University, The Behrend College located in Erie, Pennsylvania. The summer internships are open to students who have completed required core courses within the major, have an acceptable G.P.A., and who are entering their senior year of the baccalaureate Mechanical Engineering Technology program. The summer internships were developed to decrease the demand on faculty advisors of industry related senior design projects, and to fulfill the need of industry for completing entry-level engineering tasks while at the same time enabling them to evaluate a student for full-time employment upon graduation. The student in turn receives three academic credits in an industry related senior capstone experience, and in certain instances, has an opportunity to graduate a semester early.

Introduction

This past summer concludes the second year of summer internships conducted by students in the Mechanical Engineering Technology (METBD) program at The Pennsylvania State University, The Behrend College (PSU-Behrend) located in Erie, Pennsylvania. The summer internships are open to students meeting a minimum GPA and who are entering their senior year of the baccalaureate METBD program. This paper will discuss how the Summer Internships were developed, managed, and the current state of participation, including the following: benefits, opportunities, and issues.

The need to consider a formal internship experience arose because increasing enrollments within the major made it difficult to support a high number of 3 to 4 student teams on industrially sponsored senior design projects normally scheduled by students in their senior year. The demand for faculty advisors for each team was exceeding the available faculty resources. Simply increasing the size of each team was not an option. Faculty generally agreed that it was undesirable to increase the team size since it compromised the quality of student learning, and it made it difficult to evaluate the level of individual student contribution to the project. Furthermore, large teams sometimes forced a subdivision of project task assignments that lessened student involvement and responsibilities to a level below that required for a senior capstone experience. From the student's standpoint, it was not desirable to consider a capstone experience that did not provide direct student involvement with industry since this interaction benefited the student placement opportunities either by allowing a direct association with a potential employer or by enhancing their resume as a result of the added industrial exposure. A means was therefore needed to spread the faculty load without compromising the overall quality of the intended learning experience.

To satisfy the need, a formal internship experience was developed. Prior to the end of the spring semester of the student's junior year, a student interested in enrolling in the three-credit Summer Internship must identify and obtain an industrial sponsor for the summer, must develop goals and objectives for the internship experience which satisfy the sponsor's needs and which satisfy academic requirements, and must submit a formal application for course registration and credit. Once the application is submitted, the student's academic record and the proposed scope of the student's duties during his summer employment are reviewed. If approved, the student is then permitted to enroll in a three-credit Summer Internship course.

Course Requirements

In order for the student to receive full credit for the summer internship course, they must adequately perform at least 120 hours of engineering or engineering related tasks, compose an internship paper discussing their internship experience, and give an oral presentation discussing their internship experience. Engineering and engineering related tasks exclude strictly drafting or technician level responsibilities. The internship paper must be a minimum of ten pages and is due prior to the beginning of the fall semester. The students give oral presentations of their internship experience to their classmates and invited guests during their fall semester Senior Capstone course. A formal performance evaluation is also submitted from the industrial supervisor.

The student receives 3-credits for successful completion of the summer internship course. The student is then permitted to substitute those credits for the required 3-credit senior design course. The benefits of this are stated below in the Advantages/Benefits section. The substitution of the summer internship course credits for the senior design course credits is permitted due to the similarities between the two courses. Both courses require the student to work with a faculty and an industry representative to perform engineering or engineering related tasks to solve an industrial design issue. The scope of the design issues, in both the senior design course and the summer internship course, are very similar.

Faculty and Industrial Involvement and Responsibilities

There are three faculty members that have direct responsibility of the Summer Internship course: the Department Chair, the Faculty Supervisor, and the faculty member of the Senior Capstone Course. Also, the Industry Supervisor is in constant, daily contact with the student during the internship. The students email the Faculty Supervisor weekly. Their email includes the status of all their tasks/milestones/projects, as well as any questions or concerns they may have. The Faculty Supervisor is able to deduce whether or not the students have strayed from the scope of their internships.

The Department Chair and the Faculty Supervisor approve the scope of the summer internship prior to the students starting their internships. The student and the Industry Supervisor complete an Internship Agreement Form. The scope of the student's summer internship is defined within the Internship Agreement Form. The Faculty Supervisor reviews the completed Internship Agreement Form and determines if the scope is within the guidelines of the Summer Internship. If the Faculty Supervisor approves the scope of the internship and that the student has fulfilled the prerequisites of the course, the form is forwarded to the Department Chair for final approval.

Once approved, the Faculty Supervisor discusses the requirements for the course with each individual student prior to the student starting the internship. The Faculty Supervisor remains in weekly contact with the interns throughout the summer. The Faculty Supervisor offers support to the students to complete their employment tasks, and assists the students in developing their summer internship paper. The Faculty Supervisor reads and grades all internship papers. Also, the Faculty Supervisor is responsible for coordinating the grading and submitting final grades.

The faculty member of the Senior Capstone course schedules and grades the intern on their oral presentation of their internship experience.

The Industry Supervisor serves as a manager, mentor, and evaluator to the student. The Industry Supervisor assigns the student the engineering and engineering related tasks and at the end of the internship evaluates the student. The Industry Supervisor evaluates the student per an Internship Evaluation form provided by the METBD program department. On the form are specific criteria to evaluate the student to facilitate a more consistent grading among the interns and to provide the necessary feedback.

Communication

Comments and feedback are encouraged from the Industry Supervisor. Comments and feedback are collected by two methods: on the Internship Evaluation Form and through direct contact between the Faculty Supervisor and Industry Supervisor. The Faculty Supervisor contacts each Industry Supervisor to solicit their comments. Positive comments outweigh the negative; however, negative comments are considered and implemented if deemed appropriate.

In addition to the weekly emails sent from the student to the Faculty Supervisor, the Faculty Supervisor's website serves as a communication vehicle. The website has an extensive amount of information regarding the internship. The website contains the following information: procedures, forms, guidelines, prerequisite information, FAQ's, important dates, grading, and internship paper format downloads. The information available on the website is a valuable communication tool for all parties involved since there is not a formal and regularly scheduled meeting between the student and the Faculty Supervisor. The URL link to the website is http://enr.bd.psu.edu/nitterright/public_html/index.html. The internship information is contained in the METBD 495 – Summer Internship section.

Advantages/Benefits to date

The internship program offers advantages to industry, students, faculty and the college. The Summer Internships were developed to decrease the demand on faculty advisors of industry related senior capstone experience, and to fulfill the need of industry for completing entry-level engineering tasks while at the same time enabling them to evaluate a student for full-time employment upon graduation. The student in turn receives three academic credits that can be substituted for their Senior Design course requirements. Also, a student, usually one who is out of phase and has enough credits to graduate in the fall semester of their senior year can do so without attending another semester to complete a year long senior capstone course. The faculty load has been reduced by up to six senior capstone project teams enabling improved supervision on the normally scheduled capstone projects. In addition, the faculty supervisor gains added compensation for his summer work.

Based upon internships completed to date, the following assessments have been made:

- The quality of assignments provided by industry and the student involvement is very high and in most instances exceeds the scope of those conducted in the normally scheduled senior design course.
- Students participating in the internship experience uniformly agree that it has enabled an improved understanding of how learning objectives within the program are applied in the workplace¹.
- Learning objectives established for the regularly scheduled senior design experience are being satisfied by the internship and thus providing the option does not compromise program goals.
- Since students secure their internships directly because of contacts they may have, new companies are being introduced to Penn State Erie, the METBD program, and its graduates
- Student oral presentations in the semester following the internships are used to expose lower-classman to real life work experiences and to demonstrate what a program graduate may accomplish.
- Interns are happy to be working with a company that interests them rather than one which may be assigned to them during the capstone course.
- A number of students who because of transfers or other reasons are out of phase have been enabled to graduate a semester sooner (usually in nine semesters rather than ten)
- The program benefits by gaining a broader critique of our student preparedness by the students themselves (through a self evaluation provided within the project report) and by the industry through their student evaluations. This has established an additional, beneficial metric used in program assessment and efforts directed at continuous improvement.

Promoting Engineering Technology to Freshman

One of the requirements of completing the internship program is to orally present their internship experiences to their classmates. This is done in a one-credit capstone course following their internship. Their presentations are delivered in formal manner, and the instructor evaluates the presentation with the help of a critique form. Following the presentations, questions from their classmates are answered. There are several inherent benefits of these formal presentations.

- The intern presents their real-world engineering experiences to their classmates, all of whom are seniors interested in what experiences might await them upon graduation.
- Many interns agree that this oral presentation is a great experience. It often is described as their first technical presentation that they really enjoy.
- Freshmen from the major are given extra credit in their Freshmen Orientation course for attending the internships oral presentations. This has proved to be the best way to orient freshmen as to what engineering technology is, and what they might learn in their college career.
- Guests are encouraged to attend the presentation, especially from lower-level classes and through the student section of the American Society of Mechanical Engineers (ASME).

Guests are impressed with the professional level of the presentations, and the extent of technical knowledge and abilities of the interns.

Current Status

During the summer of 2000, there were 13 Summer Internships conducted. All were considered highly successful which led to 2001 summer's internship participation of 20 students. Success was defined from the amount of negative/positive feedback received from the following people: the students, the industry sponsors, and from observers (i.e. faculty and students) of the project presentations. Very little negative feedback was received and was quite overshadowed by all the positive feedback from the students, the employers, and the faculty that were either directly or indirectly involved. Several students have received full time employment offers at the end of their Summer Internships.

Students have completed their internships at various companies throughout the United States and Mexico (see Table 1.0).

Table 1.0
Company Sponsors and Their Locations

<u>Company</u>	<u>Location</u>
Aalborg	Erie, PA
Advanced Cast Products	Meadville, PA
Ameridrives	Erie, PA
BioControl Technology, Inc.	Indiana, PA
Bombardier Transportation	Pittsburgh, PA
DeZurik/Copes-Vulcan	Lake City, PA
DRT Enterprises	Philipsburg, PA
GE Transportation Systems (G.E.T.S.)	Erie, PA
G.E.T.S.	Grove City, PA
G.E.T.S.	Juarez, Mexico
Harvestmore Grape Harvesters, Inc.	North East, PA
Hilliard Corporation	Elmira, NY
HYDRO-PAC Inc.	Fairview, PA
HY-Tech Machine Incorporated	Cranberry Township, PA
John Deere - Horicon Works	Horicon, WI
John J. McMullen Associates, Inc.	Pittsburgh, PA
JRB Company, Inc.	Akron, OH
Lord Corporation	Erie, PA
Reed Manufacturing	Erie, PA
Rehrig-Pacific Company	Erie, PA
Seaway Industrial Products, Inc.	Erie, PA
Wegmans Design Services Group	Rochester, NY
Windsor Beach Technologies, Inc.	Erie, PA

Future Work

To continue the success of the Summer Internship Program, the following measures have been developed.

- A direct follow up with companies has been implemented to ascertain if they desire to sponsor senior projects or other interns.
- New to PSU-Behrend companies are invited to participate in the annual career fair.
- Review and continue to improve the metric used for student evaluation.
- Continue to improve the written promotional literature explaining the internship program.
- Continue to improve the web site explaining the program, its benefits, and requirements.

Bibliographic Information

1. Johnston, Stephen, Taylor, Elizabeth, Chappel, Alan. "UTS Engineering Internships: A Model for Active Workplace Learning", International Conference on Engineering Education, August 2001, Session 7B6, p. 5.

Biographical Information

FREDRICK A. NITERRIGHT, M.S.M.S.E.P., Lecturer in Engineering at The Pennsylvania State University, The Behrend College, since 1999. Adjunct faculty at Westmoreland County Community College for 8 years. Engineering positions in industry include: Tool Designer for a Machine Shop, Mechanical Process Engineer for an Electrical Contact Manufacturer, and Project Engineer/Team Leader for a Custom Plastic Injection Molder.

DAVID E. ROTH, B.A.E., M.A.E., P.E, Associate Professor of Engineering at the Pennsylvania State University, The Behrend College, since 1976. Worked as a consulting structural engineer prior to Behrend College, and has consulted in many aspects of building structure and construction over the last twenty-five years.

KENNETH FISHER, M.S.M.E., P.E., Professor and Chair of Mechanical Engineering Technology at the Pennsylvania State University, The Behrend College, since 1988. Served as an adjunct faculty at Gannon University prior to joining Penn State Erie. Engineering experience totals 20 years and includes responsibilities as a Research Engineer for a telecommunications firm, and as a Design Engineer and Director of Engineering for a health care industry.