Internships, Capstone Projects, Engineering Centers, and Other Methods to Work with Industry

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Introduction

Examples are covered here of internships, capstone projects, engineering centers, and other methods to work with industry to give students more real world experiences. At Carnegie Mellon University assessing the impact of mandatory internships on employability of recent college graduates in Mexico is taking place. At Weber State University changing capstone projects in a way to improve the curriculum is happening. At Texas A&M University telecommunication engineering technology students are learning via the Cisco Test Engineering Center. At Purdue University – West Lafayette they are making it real by immersing students in week long enterprise resource planning simulations. At Vancouver Island University their “Mission Impossible” is providing maximum learning in minimum time. And at Florida Atlantic University engineers and other people are communicating engineering results to a larger audience.

Assessing the Impact of Mandatory Internships on Employability of Recent College Graduates in Mexico

Internships have often been required for graduation by institutions of higher education because internships are perceived to help students increase their employability. Here the focus is on whether students’ performance as interns and the number of internships they completed are significant in determining their employability in various labor-market conditions. The study analyzed the records of 1,184 graduates at a private Mexican university who had completed undergraduate degrees in business, design, and engineering as well as mandatory internships between 2006 and 2009. A logistic regression model for job placement four months following graduation included: individual factors, personal circumstances, external conditions, and interactions with external conditions. Variables found to have a positive impact and a strong significance on the probability of employment (in order of decreasing influence) were: an excellent performance as an intern, a high degree of social connections, and high admission score. Moderately significant variables were: students’ having graduated from the engineering school, labor-market conditions during the job search, a good performance as an intern, and being male. Variables with a negative impact on employability and a strong significance on employment were the interaction between students having graduated from the engineering school and their performance as an intern. Moderately significant variables were the interaction between...
labor-market conditions and how early graduates began their first internship. This study revealed that the performance as an intern played an important role on employment and that employability depended on the interaction of a graduate’s personal assets, his/her family connections, and whether or not the labor market was contracting.¹

**Changing Capstone Projects at Weber State University**

Currently, at Weber State University there are four engineering technology programs at WSU that have all taken slightly different approaches to the ABET required capstone or integrating experience. In 2011 an executive level advisory board for all engineering technology programs (Manufacturing Engineering Technology - MFET, Mechanical Engineering Technology – MET, Design Engineering Technology – DET and Electronics Engineering Technology – EET) reviewed our capstone project approach and asked for changes. During this review of Weber’s capstone efforts the advisory board was asked by the Engineering Technology Department for permission to attempt more design only projects in a budget cutting effort. This answer was a resounding no. The design-build capstone was felt to be the best “standard” project. The committee also felt that Weber should attempt more multi-discipline team projects as well as several different types of capstone projects that might fit their needs better and better serve students. The committee wanted to see some MFET research projects and more projects where students were allowed to work in industry as a student member of an industrial team. An attempt at a variety of these requested capstone projects during the 2011-2012 school year was made. Two research projects were completed, three MFET students completed individual projects as student members of an industrial team, and a major project was attempted that required the input of MET, MFET, EET and DET students. At this time results have been encouraging and will be evaluated by faculty and the advisory committee during the 2012-2013 year.²

**Fostering Telecommunication Engineering Students via the Cisco Test Engineering Center**

An autonomous software and system quality assurance engineering facility, Cisco Test Engineering Center (Cisco-TEC), on the Texas A&M Campus has been realized by the generous equipment and monetary contributions of Cisco Systems. It is envisioned that the Cisco-TEC is directly contributing to industry’s product quality improvement, to foster top quality engineering students with “hands on” experience, to establish student education and knowledge bases, to recruit more students into the field of test engineering, and eventually, to become an internationally recognized applied research facility in software and system test engineering. Currently, 25 Cisco-TEC students are working as student workers on campus during the semester on various Cisco projects that include routers, switches, cameras, wireless access points, network management systems, networked storage systems, and Voice over IP devices. As a result, the Cisco-TEC provides “hands on” opportunities for the students to work on projects using Cisco’s newest products. In fact, many of the products being tested are not even on the market yet. As initially designed, the Cisco-TEC is autonomously run by student leaders, not by faculty members. Students teamed up with a leader are planning projects by negotiating directly with Cisco engineers. The experience not only improves students’ technical knowledge, but also exposes them to real-world project management skills including deadline management, risk management, team responsibility, human networking, and so on, which skills are not easily
taught in class. Here is presented how this year-long in house internship can foster the students to be successful in their engineering careers. 3

Making It Real:  
Immersing Students in Week Long Enterprise Resource Planning Simulations

As members of the SAP University Alliance program, students within the College of Technology at Purdue University have access to a plethora of curriculum which allows them to apply supply chain systems knowledge in an actual Enterprise Resource Planning (ERP) system. One innovative technique is the use of ERP simulations to facilitate learning. In a simulation experience, students are able to use situational learning to perform tasks associated with a distribution, manufacturing or even a logistics company. Managing the entire cash to cash cycle, students are put in charge of tasks such as pricing, marketing, procurement, production planning and logistics with the ultimate goal of maximizing profitability. Here is sought a move beyond that of a traditional simulation experience and explore new pedagogies and delivery methodologies. A typical simulation occurs in a lab environment over the course of an hour. Courses are comprised of students with varied work experience majoring in different fields of study. Participating in interdisciplinary teams of 3-4 member teams, students play three periods of fifteen to twenty minutes each in an effort to understand the impact of collaboration in the supply chain and how ERP systems are used to support diverse industries. Typical simulation result in roles being divided amongst team members with participants assuming responsibility for a core business function. While a beneficial experience, it does not often materialize in in-depth understanding of the ERP system. Students experience difficulty making long lasting meaningful connections of course material to industry practices. To add depth and breadth to this learning experience, a new approach was attempted. As part of a Graduate Seminar Course, instead of merely experiencing the short game cycle, students played the three quarter version of the game over a multi-week period. Additionally, they went from playing the basic version of the manufacturing game in the condensed timeframe to an advanced version in the extended timeframe. Here will be revealed how this tiered approach resulted in greater student mastery allowing participants to actualize how ERP systems are used in industry. The extended experience allowed for the attainment of knowledge that transcended beyond the mere acquisition of facts and skills. The immersed experience was more in line with industry training and students exited the course with a deeper understanding how enterprise functionality transcends departmental boundaries and integrates the various departments within an organization. 4

Mission Impossible – Maximum Learning in Minimum Time

Industry is continually saying that they want students to graduate as a fully trained and fully experienced worker that they can send out on their own to repair and service equipment. The students want to graduate as fully trained and fully experienced workers in less than one year. Of course, this is an impossible task…or is it? Here the concept of maximizing learning in minimum time will be explored and what needs to change to allow this pedagogical shift. Lectures are a thing of the past. There is very little learning accomplished there. Concentrating theory without practice leaves students questioning everything. The final learning doesn’t happen until theory is put into practice, so the more intertwined they are, the better. Work experience,
co-op, and practicum, whatever you call it, must be threaded throughout the theory. One-on-one mentoring on a day-by-day basis would accomplish the task, but at what cost? So what can be done to our curriculum design? And what can be done to the way we teach, in order to improve the final graduate in so short a timeframe? Vancouver Island University has a unique model that would benefit many other programs. Learning is designed around a 4-day week, allowing for one day a week of work experience. Students must find an employer willing to take them on for unpaid job shadowing. The teaching schedule is flexible, and the curriculum can be stretched in whatever direction the teacher or student wants to stretch it. When the student chooses his or her own topic, they are interested; and they will learn much more than a teacher could teach, and in a much smaller timeframe. The final result? Students that can really pull their weight in the workforce. Mission Impossible? It is not thought so.5

**Engineers and Other People: Communicating Engineering Results to a Larger Audience**

Engineering has improved human life in so many ways: from computers and cell phones to safe drinking water and an adequate food supply. Because engineering is so complex, engineers require a means of communicating with each other so that the essential details are conveyed as effectively as possible. This language, and the skills needed to understand it, has contributed to the stunning accomplishments in the field of engineering. The language that engineers use to communicate with each other can serve as a barrier to a broader audience. The requirements of this less-technical language are very different from the specialized language used by engineers. The goal is not to communicate all the technical details needed to create a product, but rather to communicate the essential ideas in a way that promotes interest in and respect for engineering. The purpose here is to clarify the problem, offer general lines of solutions, and provide a step toward communicating one example of engineering accomplishment. The focus is on the design cycle: what it is, why it is important, and how research can reduce the time needed to design a new product. Here is described how this can be optimally conveyed to other people – the 99% of the population who were not trained as engineers. The relations of engineers to other people figured prominently in the student discourse. These references also were marked by strong contrastive language about the actions underlying and shaping the connection between engineers and others. Throughout the set of portfolio statements, reference was made to decisions. Implicit in these references is the construction of engineering as a site of decision-making. In this construction, engineers make design decisions and then must cope with the real world constraints on their designs. These constraints intersect with the creative world at the point where communication takes place. That is, there are two types of decisions: one that relates to the world of theory, and one that facilitates the real world of constraints. In this extract, creating complex objects is constructed as separate from the act of communication and working with others. This contrast is marked by the contrastive term “even though” as well as the description “hard to accept,” characterizing the attitude toward the “real-world” need to connect to others. As an engineer, it is hard to hold back egos (and tongues). It is hard to accept that even though engineers are able to create complex objects that could save lives or millions of dollars, it is all worth nothing if they cannot communicate ideas or work with others. Having real-world skills differentiates the good from the great. Engineers are creative, the source of ideas, but must live with and respond to the “real-world” presence of others. The “great” engineers accept this necessity of communication and, by implication, the presence and impact of other people on the
creation of “complex objects” of great value. In this extract, communication and working with others is equated with “real-world skills.”

References


