Transitioning from Industry to Education: The Second Year

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Abstract

The transition from industry to education was an exciting, terrifying, and rewarding process. The first year offered numerous challenges and opportunities including how to effectively utilize 30 years of engineering industrial experience in the classroom. In the end, many lessons were learned and true partnership developed with the students. They were learning to be engineers at the same time that a former engineering manager was learning to become an effective teacher. Both learned a great deal from each other and together.

Then the second academic year began bringing with it an entirely new set of challenges and opportunities. Instead of the activities becoming easier and perhaps somewhat routine, they were even more complicated and time consuming. New obligations required extra time and effort including committee involvement, starting a new series of courses, implementing new programs, planning for an additional new academic program, the pursuit of tenure, and of course teaching a full load of classes. How could all of this be accomplished?

The second year demanded far more effort than the first, but the experience gained proved to be invaluable and was fully utilized. The skills directly transferred from actual engineering and managerial experiences were once again applied to the education process with great success. Being proficient in planning, scheduling, organizing, exploring, controlling, mentoring, communicating, leading, budgeting, administrating and allocating scarce resources made completing the tasks possible. It wasn't easy but the hard work was rewarded with a wonderful and inspiring year.

This paper describes the trials, tribulations, successes and lessons learned during the second year as a full-time engineering educator. The results may be of great benefit to new faculty members along with those in industry considering a similar career change.

Introduction

Even before the start of the second year as a full-time professor in the Engineering and Design (E&D) Department at Eastern Washington University (EWU) it was apparent that it was going to

be very busy. There were new courses to prepare, department and university committee appointments, new academic programs to develop, professional papers to write, and the quest for tenure. As is always the case, numerous unanticipated events and activities occurred requiring additional time and effort.

The preparation of new courses is both an exciting and time consuming process. It requires writing syllabuses, lecture notes, projects or homework assignments, and examinations. This can easily become an overwhelming task for the new professor. However, by utilizing the lessons learned from the previous years experience [1] and referring to the many excellent books and papers written on effective teaching techniques and practices including those by Gupta [2], Wankat [3], Laurillard [4], Ramsden [5], Knight [6], and Yelon [7] the task became manageable.

Appointments to department and university committees were an entirely different matter. They offered an excellent opportunity to work with other faculty members both from within the department and from departments throughout the university. It was a very rewarding experience that greatly expanded a new educator's exposure to the academic world. However, they were also very time consuming requiring a great deal of preparation in addition to the actual meetings.

It was exciting to be part of a dynamic and growing department. As a direct result of accomplishments from the first year, a new Software Engineering Technology (SET) program was added expanding the options for students. In addition, a local Cisco Networking Academy began operation with a new lab and equipment. Then the opportunity arose for a full Electrical Engineering (EE) degree program requiring an enormous amount of justification and approval effort.

With all of these tasks along with many unexpected responsibilities to complete, it became a real time management issue. By relying on the skills, tools, and experience utilized in industry and transferred to academics these challenges were quickly brought under control. With patience and the willingness to seek advice from seasoned faulty members the difficult work load became systematic and tolerable. In addition, excellent articles by Kaw [8], Dean [9] and Miller [10] shed valuable insight and direction aiding the new educator through the transition process.

Teaching Skills

Perhaps the most notable development during the second year was the vast improvement in teaching skills. This was due in part to experience, assistance from other faculty members, and just plain hard work. The beneficial effect was teaching became more fun and less drudgery.

Preparation time was greatly reduced while the course materials were significantly improved. Many of the courses taught during the first year were also taught during the second. This offered the opportunity to refine and improve the course material. As a result, both the content and presentation of lectures were more creative, interesting, and informative. Student interaction greatly increased leading to many lively and rewarding discussions.

Apparently the students also enjoyed and appreciated the teaching style utilized by a former engineering manager because they recommended the courses to their friends. Each section taught

was full with a waiting list while other sections for the same course taught by other professors always had available seats. This enthusiasm was also apparent in the work submitted. Test scores improved as did the quality of written essays and assignments.

Committee Work

Appointments to department and university committees offered entirely new challenges. A wide range of opportunities to serve the academic community existed and most had open positions. The issue became not only which committees to choose but how many. In addition, selection was automatic for some departmental committees. Ironically the biggest problem involved becoming over extended by trying to do too much.

Selection to the University's Course and Program Approval Committee (CPAC) was met with both high interest and high anxiety. Unfortunately the committee's reputation for in-depth preparation and long meetings preceded the appointment. The benefit was that all course and program changes for every department in the university had to pass through this committee. It also offered a terrific opportunity to collaborate with other professors and administrators while updating and improving the university's curriculum. Even though it was a great deal of work and required a lot of time it was a very gratifying experience that created opportunities to interact with faculty members from all disciplines. This effort was rewarded by election to the chair's position for the next year.

Appointment as the Chair of the Software Engineering Technology (SET) Curriculum Committee added more responsibilities. However, they were well received since one of the main reasons for joining EWU was to develop and start this program. A study of all existing SET programs was undertaken and site visits were made to the Oregon Institute of Technology, Arizona State University, and the University of Southern Mississippi. The best practices found in these programs were determined and collectively imported into the SET program. Most notably these were industrial collaboration, project centered, and student retention. It was further determined that presenting students with a series of real problems to solve was the best approach to attract, retain, motivate, and encourage students in a mathematically intensive curriculum. The resulting SET program focuses on an experience-based learning model that provides students with the necessary fundamentals to be able to solve technical problems for industry and society thoroughly engaging students in this process. The SET curriculum design was prepared, reviewed, and approved by the faculty of the Engineering and Design (E&D) and Computer Science (CS) Departments and by the University's Undergraduate Affairs Council (UAC). Curricular goals identified by the newly created Advisory Board with members from both local and regional industries were also incorporated in the design. These included integrating new learning strategies and problem solving techniques, obtaining active local and regional industry participation in the program, and creating a recruitment and retention plan for underrepresented students. The opportunity to develop a new curriculum by investigating the best programs in the country and incorporating pieces from them along with new ideas was a very invigorating experience. This learning opportunity should be made available to all new faculty members. The end result was a quality curriculum.

Serving on the Electrical Engineering (EE) Curriculum Committee offered another opportunity

to create an entirely new program from the ground up. The goal was to offer an innovative curriculum based on a solid foundation of engineering principles along with an experienced-based service-learning approach. An investigation was launched into leading EE programs both in the region and the nation to determine the best practices, specializations, and courses to incorporate into the new program. The EE program was also organized around an experience-based learning approach that gives equal importance and attention to service learning as well as industrial collaboration. This approach provides students with the necessary fundamentals to be able to solve technical problems both in industry and society. Current pedagogical evidence shows that community involvement is important both in the technical and civic aspects of the curriculum. Service-learning was integrated in the engineering curriculum in four basics ways: (1) revising existing courses, (2) working with co-curricular programs, (3) creating new courses, and (4) spanning two or more courses. Even though the initial preparation for this new program has been completed, a great deal of planning and development work must still be done before the first junior class arrives in the fall of 2005.

Both the Computer Engineering Technology (CET) and the Mechanical Engineering Technology (MET) programs were approaching reassessment resulting in membership on the Department's Academic Assessment Committee. The development of an updated Assessment Plan for both programs was required to meet the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET) criteria. Even though the actual assessment was over two years away, it was time to begin the preparations. Documentation had to be written, samples of student's work had to be collected, and surveys from recent graduates had to be conducted along with numerous other data gathering tasks. The amount of effort involved in this process was totally unanticipated and unexpected. This entire procedure was truly an eye opening experience for the new educator.

Volunteering to serve as the faculty advisor to the Engineering & Technology Club led to increased contact with students from all of the majors offered by the E&D Department. Meetings were held twice a month and quarterly events planned. They included the annual Bridge Bashing Competition, Engineering Days activities, and the Human Powered Paper Vehicle (HPPV) Competition. These activities offered the students opportunities to directly apply their classroom knowledge to some real-world engineering challenges while having fun in the process. Working with the students outside of the classroom provided an additional dimension to the development of a new faculty member.

Additional effort was required as a member of the building committee. A new state-of-the art facility to host the recently formed School of Computing and Engineering Sciences (consisting of the Engineering and Design, Computer Science and Physics Departments) was also being built. The new facility, housing 15 classrooms (three wired for distance education) and 21 laboratories, with many spaces designed for interaction and collaboration between departments, will open in the spring of 2005. The challenges and opportunities arising from construction of a building this size was innumerable. The objective was to initially build in capabilities to meet the needs of the future without entirely knowing what they were. The scope of this process was almost unimaginable. However, after a vast amount of work and a great team effort everything is coming together.

New Programs

Perhaps the most exhilarating experience was the preparation, development, and implementation of new programs for the department. They reflected the changing needs of industry and other organizations for graduates with new skills in emerging and fast growing fields. This dynamic approach to education insures that the university remains on the cutting-edge of technology and provides graduates with the skills that employers need. During the second year two new programs were implemented and a third entered the planning stage.

The Software Engineering Technology program was the first to be implemented. The SET program emphasizes the application of engineering principles to solutions of practical problems within the contexts of understanding, developing, operating and maintaining software and software intensive systems. The program bridges software and hardware technologies by establishing a close alignment between the Engineering and Design (E&D) and Computer Science (CS) Departments. Not only are faculty and courses shared, but both departments will be housed in the new School of Computing and Engineering Sciences facility to increase collaboration. As a result, students who graduate with a Bachelor of Science in SET enter the workforce as software engineers or technologists, application engineers, systems engineers, test engineers, systems analysts, and programmer/analysts. The best practices and curriculums currently used were investigated, expanded, and customized for this program. Leading this effort was a great deal of work, but the end result was well worth it.

In addition a Cisco Local Networking Academy was established. Now students can enhance their technical education by studying computer networking and preparing for the Certified Cisco Network Administrator (CCNA) exam. This certification is a valued and attractive elective addition to the Computer Engineering Technology (CET) program. The four CCNA courses are offered in an accelerated format complete with extensive laboratory experience. In order to facilitate this program, a new computer networking laboratory was created complete with switches, routers, and a full array of test equipment. In order to start this academy instructors had to be trained and certified by Cisco. This included completing an extensive set of instructors' courses along with passing Cisco's instructor exam. Taking charge of this process and beginning this new academy was a time consuming, demanding and yet very gratifying experience.

Planning for a new program in electrical engineering became another major challenge. Currently there is no additional capacity in the existing electrical engineering programs offered by the public universities in the State of Washington. As a result, the 2003 Washington State Legislature approved and Governor Locke signed into law EHB 1808, which provides the opportunity for all state universities to offer electrical engineering (EE) programs. Consequently Eastern Washington University became the first regional comprehensive university in the State to pursue and develop an EE degree program. Along with coursework, faculty, community, and industry partners have been established to engage the students in the fundamentals of critical thinking, communication, and teamwork. The program emphasizes the best of engineering theory, professional practice, cutting-edge software, design, and manufacturing processes while utilizing instructional methods in the way people learn best. The outcome will be highly capable engineering professionals with both theoretical and active knowledge of engineering. The

knowledge gained by developing this program and obtaining approval from the Higher Education Coordinating Board was invaluable and should be experienced by all new professors.

Service Projects

During the year a number of occasions to offer service to the department and university also surfaced. These included participating in student recruitment activates, becoming one of the founders of a new organization to promote engineering education in the middle and high schools, becoming an accreditation evaluator, and assisting with various student competitions. Each of these opportunities presented a satisfying chance to serve the academic community.

Working with new student recruitment yielded numerous benefits. During the on campus open houses discussions with potential students and their parents offered time to determine their field of interest. This one-on-one interaction presented invaluable assistance to the student. Visits to high schools and community colleges also were helpful in guiding students' toward their educational goals. New educators should be encouraged to meet directly with potential students in an effort to understand their perspective on education.

The occasion to become a founding member of the Washington State Coalition for Engineering Education (WASCEE) occurred during the second year. The group's charter is to promote engineering education to children early in their academic careers, primarily in the early middle school years. This state wide coalition was formed as a partnership between community colleges, universities, and industrial associates to encourage young students to pursue engineering careers. The organization's objectives are to insure that enough engineering students graduate and are available to meet the future needs of industry. Working to insure that America maintains its lead in technology by nurturing future engineers became a very worthwhile cause for the new educator.

The second year offered the opportunity to become an evaluator for the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET). By representing the Institute of Electronic and Electrical Engineers (IEEE) programs in the areas of Electrical Engineering Technology (EET) and Computer Engineering Technology (CET) could be evaluated. After completing the extensive training process the first accreditation visit was completed in September of 2004. The benefits derived from this service are twofold. First, by assisting other universities with an independent evaluation of their programs and second, by helping your university prepare better for its accreditation visits.

Each year EWU's E&D Department hosts the annual Intercollegiate Human Powered Paper Vehicle (HPPV) Engineering Competition. Colleges from Washington, Idaho and Oregon participate in this event. This engineering competition inspires students, challenges their engineering skills and creativity, and provides a format that limits the amount of money needed to field a competitive team. There is no cost to enter the competition. The only costs involved are for materials and time. The basic concept is to construct a human powered vehicle out of 90% paper products (by weight). The remaining 10% is limited only by the imagination of the designers. There are two parts to the overall competition, the first tests the vehicles performance and the second gauges the team's presentation skills. These events are treated as separate

portions of the overall competition, although participation in both events is required. This engineering design project helps develop student excellence in team work, communication, and creative problem solving. Awards are then presented for both categories: vehicle performance and team presentation. Functioning as a judge for this competition offered a valuable opportunity to once again observe the students applying their engineering knowledge and skills toward solving a practical problem.

Serving as a judge for the regional Science Olympiad competition also offered the opportunity to interact with younger students that may be interested in engineering careers. For the Robot Billiard Contest, students had to not only build but also operate their device to put the balls in the appropriate hole. It was exciting to observe the concentration, spirit, and teamwork displayed by the students. It became obvious that it is extremely important for the new faculty member to get involved in similar activities.

Grant Applications

Another area of academic involvement is the writing of grant applications. In many cases it is an actual requirement of the department or university to submit these applications. Even though the competition is stiff and only a precious few are awarded, putting the proposal together became a valuable learning opportunity. The writing experience itself was well worth the time and effort.

During the second year a number of grant applications were actually written. First, an EE Planning Grant was submitted for funds to continue the development of the new electrical engineering program. A second application was sent to the Murdock Foundation for equipment and instrumentation for the laboratories in the new building. In addition, numerous grants were submitted directly to industry for equipment that could also be utilized in the new building's laboratories. All of these grants were coauthored making the writing and submission process much easier. The key is to locate a colleague or two with similar interests and work together.

Quest for Tenure

In addition to the regular duties required in the academic world, the goal of most college and university professors is to seek tenure. This is a complicated process that requires extraordinary efforts and accomplishments on the professor's part. As a result, the start of the journey toward tenure and promotion became the driving challenge for the second year.

The overall requirements may vary greatly from institution to institution but typically contain many of the same assessment criteria. At Eastern Washington University this entire process is rather straightforward. The evaluation process for tenure and/or promotion must be in accordance with the Collective Bargaining Agreement between the Eastern Washington University Board of Trustees and the United Faculty of Eastern. Basically professional performance expectations for tenure and/or promotion are established and agreed upon by the professor, department chair, department personnel committee, and the dean. These minimum expectations are written in the individual's Faculty Activity Plan and constitute the major criteria used to evaluate the professor for tenure and/or promotion.

The Faculty Activity Plan developed for a new faculty member with 30 years of industrial experience consists of three basic parts: teaching (65%), scholarly activity (25%), and service (10%). The percentages assigned to each section were selected from a range by the faculty member. As noted from the percentages, teaching is a primary activity for faculty at EWU. After approval the Faculty Activity Plan becomes a working document listing the requirements for tenure and promotion in this case to associate professor. The criteria for approval are clearly listed and as a result there are few opportunities for surprises. When it is determined that the appropriate criterion are met or exceeded the supporting documents along with an application for tenure and/or promotion can be submitted for review.

Many of the tasks and activities performed during the second year directly applied toward the tenure application. They included high student ratings on the student course evaluation forms, peer reviewed articles presented at conferences and published in their proceedings, submission of grant proposals, active participation in professional societies, and committee work at both the department and university level. As a result significant progress was made during the second year in the quest for tenure.

Lessons Learned

The second year as an engineering educator brought back many of the challenges from the previous year along with some entirely new ones. Responsibilities were expanded to include influential committee work, developing a new electrical engineering program, writing professional papers, and beginning the quest for tenure. Once again the skills transferred from industry greatly aided the transition process as a seasoned engineering manager became a better teacher. The most beneficial lessons learned concerned attitude, time, and preparation.

New courses are difficult to prepare for and consume a great deal of time. However, by utilizing the lessons learned from the first year's experience, the task was better planned and organized. It is unlikely that the process will ever become routine but at least with practice it will continue to improve taking less time and effort in the future.

Pick your committees wisely. Many committees require a minimal amount of outside work while others require a great deal. Select your committee involvement to complement your teaching load and other responsibilities. The selection of the Course and Program Approval Committee was a big leap requiring extensive outside review and preparation, however it was a most rewarding experience. It offered the opportunity to work with faculty from all of the departments in the university and help them improve and update their programs.

Developing a new program is also an extremely time consuming process. First the justification for the program must be written and approved by many levels both within the university and State. Then creating the curriculum required extensive efforts to insure that it was up to date and timely. Components of the developed curriculum design included integrating new learning strategies and problem solving techniques, active involvement of regional industry, and aggressive non-traditional student recruitment and retention plans. Creating and developing something new is always a challenge and one that all new faculty members should experience.

Finally, the pursuit of tenure and promotion requires preparing a detailed plan outlining all of the steps necessary to achieve that goal. The Faculty Activity Plan is a difficult document to prepare but it lists in detail all of the requirements that a faculty member must meet or exceed to attain tenure and promotion. After substantial consideration, reflection, and thought it must be carefully and systematically written. Upon approval, it becomes a roadmap for the faculty member indicating exactly where they are at all times on their tenure and promotion journey.

Conclusions, Reflections and the Future

As the transition from industry to education continued many tasks became easier, more routine and less time consuming. However, new challenges emerged in the form of committee appointments, developing a new academic program, and beginning the pursuit of tenure. Combining these commitments with the rigorous demands of the academic schedule led to a very amazing and inspiring year. By relying on the skills transferred from industry far more was accomplished than expected.

The third year will be even more demanding. Committee appointments have led to chair positions, work on the new program continues, and the quest for tenure will be paramount. All of this requires additional time and effort. However, by applying the lessons learned from the first two years experience these tasks can be accomplished.

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