Caution! Rough Road Ahead - the Transition from Industry Professional to Engineering Educator

Abstract

The decision to join the ranks of the engineering technology faculty at a well respected university was a no-brainer for two industry veterans. Once they got over the pay cut that is. Money isn’t everything, after all, and pales in comparison to the rewards of working with future generations of problem solvers. In search of those rewards, armed with 37 years of collective experience, the authors would certainly waste no time in imparting their wisdom to classes full of eager students waiting to learn what it’s like in the real world. Or would they?

The transition into academia proved full of surprises, both good and bad, for each of the authors. Some of the challenges would likely affect any new faculty member, but some are certain to be unique to the authors due to their “tenure” in a corporate environment. The freedom from corporate objectives and standard operating procedures offers a refreshing autonomy, but not without some struggles in figuring out just what to do and how to do it in an academic world where individual creativity is protected through the absence of such direction. Pairing that with a compressed timeline to climb a very steep learning curve in providing meaningful course content every day, sometimes twice or three times a day, proves to be very stressful to industry veterans who were accustomed to preparing a presentation at most once per week, but usually less.

Gone were the days of being on top of the game, knowing the core competencies of a company and the technological specialization associated with it. In the role of an engineering technology educator, expertise in seemingly all things is expected, forcing a cleaning out of the cobwebs that have accumulated on many things unused since the educators’ own education two long decades ago. While the hope is to bring real world, industry focus to the education provided in the program, the students are leery to accept this from anything less than an expert.

Success in the corporate world is usually driven by attaining corporate goals, causing employees to view problems and challenges realistically in order to meet a given timeline. Being such a realist is a stark contrast to the idealists who thrive in academia, whose lifelong search for a new innovation may go unfulfilled but will never be thwarted or discouraged. This is their purpose now, a concept that can take some getting used to. Similarly, tenure-track compensation is a difficult concept for those accustomed to the pay-for-performance structure found in industry.

This paper recounts the common experiences of two industry veterans in their first two or three years of teaching, offers suggestions to mentors and administrators of new faculty, and provides advice for other new faculty experiencing a similar transition from industry to academia. The intent is to make the road along this transition less bumpy and full of mostly good surprises so the rewards of teaching can be more quickly and more smoothly attained.
Autonomy vs. Structure

Working in industry means following at least a very broad set of corporate policies or standard operating procedures (SOPs). SOPs are employed across the entire organization and are designed to ensure that an acceptable outcome is achieved, regardless of who carries out the steps. Depending on the industry, the size of the company and the criticality of the outcome, more specific instructions and best practices are often developed and followed. In the case of an automotive engineering and manufacturing organization, there are design standards, work instructions, best practices and many formal protocols that must be adhered to when designing, developing and manufacturing products for organizations with an established customer base, or for a critical service industry. Design standards cover critical areas specific to components and/or assemblies and are developed and published by recognized professional societies, original equipment manufacturer (OEM) customers, and supplier organizations, with the intent to provide a baseline or set of minimum performance requirements that product suppliers must conform to if they are to continue to provide products for consumption. Similar standards exist in most disciplines throughout the organization, with the purpose of ensuring a certain level of quality in every process or product. Professional societies such as the Society of Automotive Engineers (SAE), the American Society of Mechanical Engineers (ASME) and the American Society for Testing and Materials (ASTM) continue to provide industry accepted standards for items such as material chemistries and properties, commodity feature and tolerance specifications, standardized testing procedures, and product performance requirements.

Best practice documentation is typically created by organizations in an attempt to pass on to future generations of employees a body of knowledge that has been developed though trial and tribulation. It can be applied to a variety of disciplines, and is created in any area where the organization feels it has endured valuable lessons that are worth repeating or avoiding, and can aid future groups by saving time and money. Standards of any form are very useful in training new employees, providing them a framework within which to learn and develop their job skills.

As industry veterans transitioning into teaching, the authors searched for the SOPs which would tell them how to do this new job, with no luck. If only someone had handed us a set of rules for what content to cover, how much homework to assign, and how to grade exams! We could have then focused our efforts on developing more competency in the given subjects before we had to get up on stage and pretend to be an expert! While many courses do have established learning objectives or course outcomes, none of them come with instructions or even suggestions on how to make them happen.

Lessons learned from industry suggest that to gain the benefit of following SOPs, using organizations must provide a system that is readily accessible, allows free exchange of information, is able to be revised as needed, and exhibits an added value to the user. Without this approach, the SOP’s or other reference documents may not be utilized due to their perceived lack of relevancy.

Formal protocols can include everything from organizational charts, which are used to identify functional positions within the organization, to standard operating procedures (SOP’s) which are used in both blue collar and white collar disciplines to provide a standardized approach to
accomplishing established tasks. While organizational charts are necessary for communicating hierarchical structure within the organization, if they are frequently revised in the absence of hiring new employees, they can be negatively viewed as a tool for empire building. SOP’s are typically used in areas where tasks are repetitive in nature and successful results hinge upon all employees completing the task in a similar nature.

Depending on your educational philosophy, the dynamic and unpredictable approach can be a welcome practice in the classroom...within reason. While the development of course outcomes is a university SOP, the means to achieve those outcomes can vary based on the specific course content, previous experience and teaching style of the instructor, and degree of technology utilization in the classroom. A standardized approach can be successfully used in some courses, however accommodation for classroom dynamics, including student feedback and assessment of learning, as well as introduction of new technology advancements in the field (if the course is technology based) would suggest otherwise. The standardized approach for teaching may eventually prove to be a mundane task for the instructor as repetitive course offerings take their toll, and the “routine” observed by students interpreted as disinterest in the subject matter. The course then becomes an obligation for the students as opposed to a truly valued learning experience. While a well organized course has its obvious benefits, standardization of the instructor / student interaction, as is frequently the case with designer / product in industry, could provide less than desired results.

Suggestions in the Area of Autonomy vs. Structure

While a standardized approach has limitations in an academic setting, new faculty could benefit greatly from it. Having a starting point, albeit an imperfect one, would reduce the uncertainty of the new role as an educator as well as the initial workload. Industry veterans may build confidence in their new role more quickly by using a proven approach the first time a class is taught. Subsequent classes should then allow for adaptation and customization as the new educator develops their own unique teaching style.

Beyond teaching, SOP’s in the areas of academic program / university advising and the tenure process would be welcome. The advising process seems to be a good candidate for standardization, in regards to academic program and university degree requirements communication. After volunteering for general university advising sessions, a better understanding of the general university requirements (GUR’s) and overall degree requirements was obtained. Prior to this, lack of available time and exposure to programs outside of our own has precluded a complete comprehension of program requirements outside of our functional department. While university requirements are typically indicated in course catalogs or online, a set of standard guidelines or an SOP could benefit the less experienced teacher and help make the process more efficient. Additionally, the development of an organizational “flow chart” for the overall advising process may be helpful when facing questions that are outside of the immediate program jurisdiction, to aid students and advisors in determining the most effective path to follow for obtaining a rapid response.

The tenure process will be discussed in a later section, but needless to say, coming from an industrial perspective, it is new territory and can be intimidating for non-academics. An SOP
would definitely benefit those new to academia and assist with a more clear understanding of expectations. Specifically, in the areas of teaching, scholarship and service, a more concrete definition of deliverables would be beneficial. From an industry perspective, most employees obtain a general understanding of their job requirements through a job description from the human resources department, and are directed by managers / supervisors as to program or project expectations. The requirements for tenure, while daunting, seem to be less definitive in nature and could use the structure of an SOP. Specific items such as a minimum acceptable level or trend in teaching evaluation ratings, specification of quantity and level of publication and presentation requirements, as well as quantification of service at the various university / community levels expected, could be included in a university or department-specific SOP.

The areas where academic best practices could be developed include successful teaching practices and laboratory activities in the various courses, effective approaches for research activities and projects, as well as successful independent study course methodologies. Senior faculty that have demonstrated proficiency in these areas, or those that continue to provide student-valued courses could develop best practice documentation, or provide video recordings of effective classroom activities.

Best practice documentation in areas of teaching that could benefit new instructors include effective syllabus development, textbook selection/review, methods of information delivery (ie. lecture-only, blackboard/whiteboard notes, Powerpoint presentations, etc.), systems for providing consistent content from course offering to course offering, and effective assessment strategies.

Laboratory best practices could include activity design, timing considerations, equipment utilization methods, as well as general laboratory facilities organization. Research activity and project based instructional best practices could cover effective activity planning, including pitfalls to avoid, and departmental / university protocol.

While there typically are orientation sessions for grant writing provided by senior faculty or foundation administrators, this can be one of the more difficult areas for those new to academia. Tips for effective, or at the very least, ineffective methods from colleagues in the same content area could make the difference in a successful R&D program or grant proposal.

Another area of concern for new faculty deals with the successful implementation of courses of independent study. Best practices, or even departmental SOP’s could help to provide definition of consistent depth of content coverage for specific credit awarded, uniform consistency of course deliverables commensurate with credit awarded, as well as a uniform grading methodology. In these instances, academia could take some cues from industry in developing more consistent, cross-discipline protocol for the areas indicated.

Class Preparation and the Development of Detailed Course Content

We long for the days back in the corporate environment when the weekly, bi-weekly or monthly meetings with critical customers or supervisors required a day, or so, of preparation, and then having the ability to retreat back to the office or cubicle to resume independent activities.
associated with the job. For the high profile meetings, content was developed ahead of time and supervisors were provided the opportunity for review and feedback prior to “show-time”. As an instructor, show-time comes every day, sometimes two to three times a day, depending on the schedule. There is no review board other than the room full of students that eagerly await the topic of discussion each day. Retreat to the office is often accompanied by several students seeking assistance with homework, scheduling or advisement, or can require attention to a task associated with the other tenure requirement activities in need of completion. New course preparation, or preparation of courses that are new to the instructor, can be an extreme challenge, to say the least. The first few years of teaching could be compared to medical student residency, or so one may believe, based on the grueling schedules and unrelenting demand for performance that can be seen on most night-time medical drama series on TV...or so we’re told, as we don’t have time for such things.

Developing competency in the myriad courses taught during our first years presented a challenge for each of us. This was a challenge emotionally because we each came from industry with certain areas of expertise which was both recognized by those around us, and rewarded by our company. Unfortunately, the courses we had come to teach were not based solely on these areas, thrusting us back to earlier developmental stages where confidence and competence are low. Combine this state of development with the need to present 3-6 hours of new material each week per class in an engaging and meaningful way, and it’s a wonder we didn’t hit the highway and head back to what we’d known!

Depending on the mode of instructional delivery, preparation for a single hour-long class can take 1-6 hours, based on content, level of familiarity with the subject, and degree of calculations required to be performed at the front of the class. Among faculty, the term “new course prep” is often met with pitiful gasps and painful expressions typically reserved for dental surgery or compound fracture wounds. One of the greatest challenges coming from industry has been dealing with the need to dust off areas of academics that have not been used in recent times, in order to provide a meaningful educational experience for the students. This can often extend the course preparation times as one strives to re-educate themselves while simultaneously developing quality course content. Our university operates on the quarter system, with few course offerings during the summer quarter in our department. Faculty loads require teaching seven courses in three quarters for tenure track instructors. While entirely dependent on departmental scheduling, the ability to repeat course offerings within the year provides an accelerated means for achieving a comfort level with the course, and for uniform course content development.

Suggestions in the Area of Class Preparation and Content Development

Thoughts on areas for making the new instructor’s experience less daunting include the typical ones such as new course selection in the area of current expertise, provision of first year reduced course load (six courses instead of seven), lessening of tenure requirements in the early stages (ie. focus on teaching; research and publication are secondary) and the availability of experienced lab technician support personnel. These are all helpful in reducing some of the load, however, further stress reducers could include allowing new instructors to audit courses to be taught or perhaps team teaching them the first time out with a more senior faculty member.
Further reductions in first year teaching loads to allow focus and optimization of one course per quarter would also be very beneficial, although this may not be an option based on faculty loads. Another area could include the extension of tenure award time periods to allow further development.

It becomes a time-based issue. The need for developing course content on an ongoing basis continually battles the need to go back, dust off the books and take another look at some areas…albeit, a more mature and goal-oriented look. Some thoughts for providing assistance in this area would be to allow for instructor training time, or the ability to monitor key courses provided by the university in the areas of need. This obviously becomes a scheduling issue and eats into the time required for course preparation, but it should be addressed during the early stages of entering into academia, before becoming entrenched in the variety of campus activities, research and tenure pursuit.

Realist vs. Idealist - Instructional Approach

In academia, as experienced by the authors during their own educational experiences, and now as educators, there is a constant struggle for determining the best instructional approach for adequately preparing the students in their field of study. Those with classical philosophies suggest that a strong background in theoretical fundamentals is the best preparatory method, and seek to provide a discrete body of knowledge, while letting the students explore specific applications for themselves, or learning on the job. Those tending toward more progressive philosophies contend that a pragmatic approach to instruction requires relevant, field-based examples to link theoretical concepts to more concrete applications.

This is one area where the pragmatic approach of industry pays off. The industry veterans’ developed skills associated with business operations, including time management, project management, the realities of customer / supplier relations, and corporate interactions, can serve as a strong practical source for related course content, and relevant course outcomes. Possessing this background tends to provide a catalyst for re-evaluating the predominantly theory-based classroom. There has been much published on the concept that students possess different types of preferred learning styles. Likewise, there are many effective educational philosophies which claim to provide the best model for instructor / student interactions.

Among the primary goals for post-secondary educational institutions are to prepare its graduates for employment and to enable them to serve as useful contributors to the community. The development of engineering technology curriculum is often based on industry needs, and a more pragmatic approach to instruction and areas of focus are sought. This is often modeled through the practice of establishing an industrial advisory board whose goal is to provide insight into current and future needs in the industry, with the intent of shaping course goals and resultant student / future employee skills set. As recent members of the larger professional society from which the advisory board members come from, industry-experienced instructors should have a more developed concept of true industry needs vs. those that have not had prior industry exposure. Those experiences can assist in developing a robust and pragmatic course. By providing course content based on industrial experience and practical industrial examples, the theoretical concepts are more readily internalized and processed by the students.
In more than one instance, when attempting to enhance existing course content, the authors have found their input overlooked, underappreciated or disregarded. Although hired in large part due to our vast industry experience, colleagues have not always been anxious to embrace our input as credible. This further exacerbates the emotional challenge noted earlier associated with a loss of expertise moving from a well established industry career to that of a new engineering educator. In this case though, we have the expertise but we’re not allowed validation by our peers, essentially negating the most positive attribute we have to offer, at least in the first few years.

**Suggestions in the Area of Instructional Approach**

As is presently done in many engineering technology programs, the educational institution should continue to develop, recruit and capitalize on input from industrial advisory committees; this is an invaluable link to the heart beat of technology and professional practice in the field. At the same time, do not overlook input from recent industry-to-faculty converts. These members have the industry experience element, in addition to a firm cognizance of institutional capabilities and limitations, and may be able to assist in developing a more synergistic relationship between the two collaborative entities.

An additional area to enhance is the solicitation of feedback from recent graduates who have successfully made the transition into industry. While some universities may provide a rather generic survey for graduates to complete, the development of a more specific instrument targeted at critical areas can aid in determining areas of program deficiency or strength, from the user’s perspective.

A final suggestion, which will also be discussed in the next section of this paper, deals with the concept of requiring, or rewarding faculty who elect to return to industry to either remain current or gain a current perspective in the field in which their graduates are entering. This could be accomplished through summer faculty internships or allowed leaves of absence for industry experience. The faculty return with a first-hand account of what is expected of their graduates, and can obtain a better understanding of current technology in the field, as well as obtaining industrial contacts for project collaboration and potential student networking.

**Performance Evaluation - Tenure-Track vs. Pay-for-Performance**

The authors recall during the interview process that one of the questions emphasized by the faculty search committee pertained to the realities of faculty compensation levels versus the equivalent industry professional levels. Either the naivety of the transition, the excitement of the change in profession, or the thrill of working with fresh young minds obliterated the harsh realities that would come to bear. The first reality that may not be recognized by all entering academia is…yes, this is a nine month position (in some cases) and you will need to find other means for sustenance over the summer, unless tenting and foraging for berries is a hobby. The second reality that may be the least anticipated deals with the intensity of workload. Again, maybe due to naivety, or the widely spread fable that “teachers have it easy”; the idea that with the nine month position comes an equivalent 25% reduction in workload is entirely misconstrued. Based on many of the items previously discussed including effort required for
course preparation, dusting off cob-webs, and tenure requirements, depending on the level and quantity of new courses encountered, the workload has felt more like 125% of the previous industry positions. Needless to say, the position has been extremely challenging, yet rewarding at the same time.

An industrial pay-for-performance system is relatively straightforward and compensates the employee for level of achievement based on pre-determined objectives. The employee goals are typically associated with the overarching organizational goals, but geared towards aspects that are within the employee’s control. Often, the organization sets aside an amount of annual profits to be distributed amongst the employees as salary increases, with the increase based on how successful the employee is in obtaining their goals. Depending on the organization, employees who are unsuccessful can be recommended for skills development. Continued poor performance can result in termination.

The tenure process continues to be a daunting endeavor, which has many aspects that are new to those coming from industry. The process requires development of teaching skills, as reflected in course evaluations provided by the students and peer evaluations, scholarly activity, as reflected in research and publication of professional documents, and service at the community, university and departmental levels. The tenure requirements were listed in an informal prioritized order, as understood by the authors. As previously indicated, the task of developing course content can be challenging in areas that are not immediately within the area of industrial expertise. Add to this the challenge of having to present the material in a sound pedagogical approach, the need to quickly adapt to the classroom environment, and necessity for effective assessment strategies, and the first requirement for tenure can prove to be a difficult hill to scale.

For many coming from industry that chose to enter into their profession upon completing undergraduate or graduate level studies, obtainment of a terminal degree was not a priority at the time. As such, unless an R&D position was their focus, many do not have an intensive research background in a specific area, nor a list of publications that have been previously completed or are in process. This results in a deficit for immediate materials for publication, or the means to quickly springboard into a new publication once entering academia. The “publish or perish” portion of tenure can instill a frenetic approach to publish in many areas, without a specific research focus or a sustainable level of interest. One opinion shared by the authors is the desire to hold off on publishing until a notable accomplishment or significant research has been completed, thereby providing the basis for noteworthy publication. While attempting to address tenure priority number one (teaching effectiveness), number two (scholarly activity) can be achieved, but probably not to the desired level of accomplishment. Additionally, based on the authors’ experience, there are no formal indications of the minimum quantity of documents needed to meet this requirement.

The third required area of tenure is service, in which the aspiring faculty member must support activities at the various levels in the community and campus environment. Based upon participation in professional societies, community education, and level of student support, this requirement tends to be the least weighted, yet can provide the means for strengthening the opportunity for success in the primary tenure goals. Access to professional societies can assist with determining proper paths for publication, and help to build collaborative partnerships with
industry representatives. Community education programs and student advising / project support can build strong relationships with students, which help to improve in-class communications, and resultant evaluations. Also, serving on university committees can provide necessary exposure to tenure granting peers and serve as a means for developing in-campus collaborative partners. The trick is to find a balance between the activities that allows you to remain sane, maintain a family life and truly enjoy what you are doing.

Suggestions in the Area of Performance Evaluation

There are many areas that can be commented on in this section that the authors can hope will be well received by administrators and decision makers at the university level. While it is unlikely that the tenure process will be revamped to reflect the industry-based compensation structure, the infusion of some pay-for-performance aspects could improve the system for both faculty members trying to survive it, and those institutions attempting to maintain and attract top level personnel.

First, to relieve some of the initial stress of the tenure process, it is suggested to allow focus on the teaching and curriculum development aspects. The foundation of strong educational experiences for the students is key to faculty and university survival in the competitive, global community. Reserve the requirements for publishing for after the fourth year of service, to allow time to discover and develop research interests which can be sustained to yield more robust documents. Make it a requirement for maintaining continued tenure by mandating 1-2 documents every two years. This will require experienced faculty members to continue research in their fields. Also, relative to the discussion on best practices, provide successful and unsuccessful examples of published documents to enable those new to publishing the opportunity to evaluate such documents prior to putting forth the effort.

While this may be limited by restricted budgets and human resources, establish a schedule that provides lighter teaching loads for new faculty in their first 2-3 years, allowing for intensive development of 2-3 courses. Once the comfort level has been achieved with these courses, open up to the next 2-3 courses, and continue this process. Provide training in areas of need or exposure to new technology, in order to optimize course content.

Compensation levels for instructors have always been a mystery to the authors. While most teachers do not enter into the field with the intent of becoming independently wealthy, it is apparent that teachers continue to be paid less, on an equivalent basis, than other professionals. The mystery is how this came to fruition. Why are teachers valued less in society than other professions? If compensation levels were to increase, some top performing professionals may take a second look at opportunities in the field, which could promote the educational system, and improve the results of our students at all levels, not just at the post-secondary level. In conversation amongst the authors, it was indicated that many of our graduates, upon taking entry-level positions in industry, surpass the compensation level of their college professors, who have significant previous industrial experience. Without belaboring the issue, the suggestion here is to study the industries in which the teachers place their students, and provide compensation levels commensurate with the value of the service that they are providing. And what about pay
for performance? Similar to industry, establish a portion of tuition revenues as a performance award fund and allocate increases based on annual tenure and promotion reviews.

In lieu of any major changes in the tenure review process, departments should at least establish a clear definition of tenure requirements in each of the areas with specific metrics and level of expectations for each functional area. In industry, performance management and competency development in its best manifestation encompasses specific, quantifiable objectives and target dates for completion. These objectives relate to job duties as well as professional development activities. A similar format, when used as a planning tool for new faculty, would help a new engineering educator focus and monitor progress on the activities and accomplishments necessary to achieve tenure. In the absence of an identified area of research interest, new faculty could be assigned small research activities designed to enhance the program or college, allowing them to learn about a variety of research areas, and possibly helping to define a research interest while accomplishing the required scholarly activity in the timeframe required for attaining tenure.

Summary

In order to ease the transition for an industry veteran into a successful engineering educator, educational institutions can incorporate the ideas outlined in this paper. Most importantly:

- Provide a lighter teaching load, allowing time to audit courses to be taught and to get up to speed with the course content before teaching for the first time.
- Provide an established structure or best practices for new classes and laboratory activities, giving the new faculty a starting point and a greater chance for success, as well as something to build upon for future classes.
- Develop a plan for achieving tenure, with specific objectives and target dates, so the new faculty can focus on the proper items and monitor their own progress.
- Rethink the best balance of teaching effectiveness, scholarly activity, and service requirements for new faculty with extensive industry experience.
- Provide training and instructional materials in student advising and grant writing.
- Respect and value the input of industry veterans joining the ranks of educators.
- Provide some financial incentive for performance.

The best advice for the new engineering educator is to be fully aware of the potential pot holes along the road and don’t dismiss them as exaggerations…they are not. Ask more questions during an interview than the interviewers ask of you. Find out how much help will be available and negotiate for what you need in your first employment contract. Engineering educators with industry experience are essential for the education of the next generation of problem solvers and it is working with that next generation that provides the rewards.