Strategies and Techniques for New Tenure-track Faculty to Become Successful in Academia

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Although engineering and engineering technology (E and ET) programs are part of STEM, in many cases E and ET faculty have different academic backgrounds and job responsibilities compared to other branches of STEM. E and ET faculty often require industry experience with the highest academic degree, and have higher teaching and research loads. Faculty are required to do a number of things that graduate school and/or industry practice don’t teach them, such as planning and delivering courses effectively, designing and starting a research program to getting it funded, attracting and managing graduate students and undergraduate students, finding and working with appropriate faculty or industrial collaborators, writing assignments and tests that are both rigorous and fair, dealing with classroom management problems and students with a bewildering assortment of academic and personal problems, doing what it takes to learn about and integrate into the campus culture, and finding the time to do all that and still have a personal life (Adam et al. 2008, Felder et al. 2012; Kember and Kwan 2000). It becomes more challenging to get established when the department or the college does not have the adequate resources to support the new faculty, and lacks a formal faculty development and mentoring program on campus.

There are some tricks of the trade—what I have learned from the literature and from my personal experience that will be shared in this article so that new E and ET faculty become more successful in their careers. Some of the key issues for E and ET faculty are related to effective teaching practices, finding time for research, inadequate feedback/recognition, unrealistic expectations from supervisors, insufficient resources and the lack of mentors. Tenure and promotion depends on faculty performance, university and departmental policy and procedures and academic and collegial environment on campus. This article will address some of the common issues and provide some ideas that new faculty can follow, and ultimately get tenured and become successful in his/her career.

As Austin’s study (2003) identified, concerns over leading a balanced faculty life and navigating the uncertainties coming from unclear expectations in new faculty roles, were plainly sources of stress for our participants. Budget cuts place stress on institutions and faculty to do more with less; shifts in preferred teaching methods from lecturing to active student-centered learning, and changing student and faculty demographics all contribute to a turbulent time on college campuses. As the newest institutional members, recent faculty hires are caught up in this changing context at the same time they are trying to establish themselves as new teachers and researchers. It is not surprising that one of the main points of stress for the participants was seeking a work-life balance.

Charles Vest, President of National Academy of Engineering has mentioned the following: “the engineering workforce of tomorrow, and indeed that of today, will face profound new challenges. Every day the men and women of this workforce will face the stress of competing in the fast-paced world of change we call the knowledge-based global economy of the twenty-first century. They will also face even larger challenges because the nation and world will need to call on them to
seize opportunities and solve global problems of unprecedented scope and scale” (Vest, Charles, 2008). In the long run, his suggestion is to make engineering and engineering technology schools exciting, creative, adventurous, rigorous, demanding, and empowering. That means faculty who design curricula, pedagogy, and student experiences will profitably contemplate the new context, competition, content, and challenges of engineering.

Due to the part of the rapidly increasing power and changes of technology, routine tasks that were traditionally performed by engineers and/or engineering technologists (E and ET) are now performed by technicians using computers while E and ETs are called upon to design, develop and use innovative products and processes, exercise new and unfamiliar technical and professional skills, and function in an increasingly global environment. What it will mean to be an E and ET in the twenty-first century and the incompatibility of current E and ET curricula with that meaning have been the subject of many high-level studies. The debate so far has had little impact on STEM educators.

According to the criteria set by Accreditation Board of Engineering and Technology (ABET), we must strengthen our coverage of fundamentals; teach more about “real-world” engineering design, development, and operations; cover more material in frontier areas of engineering and engineering technologists; offer better instruction in both oral and written communication skills and teamwork skills; provide training in critical and creative thinking skills and problem-solving methods; produce graduates who are conversant with engineering ethics and the connections between technology and society so that the average student can complete the undergraduate degree in four years (ABET.org).

In view of the broadening and rapidly shifting scope of the profession and ABET criteria, it is imperative to shift the focus of E and ET curricula from transmission of content to the development of skills, that support thinking and professional judgment. Future E and ETs will need to adapt to rapidly changing work environments and technology, direct their own learning, broaden an understanding of impact, work across different perspectives, and continually revisit what it means to be an engineer and engineering technologist. Traditional approaches to E and ET education (chalk-and-talk lectures, individual homework) are becoming incompatible. Furthermore, research on student engagement has moved the boundaries of learning environments beyond formal classrooms to informal spaces such as student lounges, professional work spaces, and virtual community spaces. What remains crucial is the importance of social learning as students interact with others such as peers, educators, campus administrators, internship supervisors, alumni and professionals, and even in social media. As such, the teaching decisions E and ET educators make can impact learning in and out of the classroom (Adam and Felder, 2008).

If courses are continued to be taught in a single subject format, (statics in one course, thermodynamics in another, technical writing in another, etc.) it will take a six- or seven-year curriculum to produce engineers and/or engineering technologist who have the desired proficiency in the fundamentals, and are conversant with methods of modern E and ET practice, culturally literate, and skilled in communication. Moreover, if students are assigned only well-defined convergent problems, they will never gain the skills needed to
tackle and solve challenging multidisciplinary problems that call for critical judgment and creativity according to ABET. Finally, even if nothing new is added to the existing curriculum, confining it to four years will be almost impossible, unless more efficient and effective ways to cover the material can be found (Felder et al., 2000). In that case, it becomes very difficult for new faculty to teach undergraduate students at a level it should be, and become successful in their academic career with the further expectation of research and services.

There is another belief among some of us: if we have significant industry experience, we can be an effective teacher and successful faculty or vice versa, meaning that successful researchers automatically convert to an effective teacher. Although transferring skills is important and can be good for the academic career, it by no means suggests that industry experience or research success will be enough to make a faculty successful. Some of the advantages of new faculty having industry experience are discussed below.

**Transferring Skills from Industry to Academia**

Industry and academia are both similar and different in many ways. They both require a set of skills that must be mastered in order to be successful. Of particular interest are the skills acquired and utilized by engineers and engineering managers during the performance of their duties. Can this knowledge be successfully applied in the educational arena as well? Unfortunately, the answer to this question is not obvious. It actually depends entirely on the skills of the individual who is teaching, content and nature of the course, and how they are applied in the class.

Engineers and engineering technologists in industry design, develop, and implement new products and processes for an entity that is trying to remain competitive, make a profit, and stay in business. Professors, on the other hand, are training and developing students to become engineers preparing them for a rewarding technical career. At first glance the two positions appear quite different and at odds with each other, but actually both utilize a wide array of engineering skills, just in different ways ((Loendorf. W.R., 2006).

The E and ET faculty is a facilitator and mentor guiding students through the rigorous educational process that transforms them into engineers and engineering technologists. Likewise, the E and ET manager is a director that steers teams of technically-trained individuals through the imaginative process of creating new and innovative devices and procedures. The common thread is a knowledge base that can be applied to many diverse circumstances.

After all, many of the problems encountered in the academic arena are similar to those found in industry but the circumstances are different. The educational goal is to successfully transfer knowledge that converts students into professionals while the industrial objective is to utilize engineering knowledge that converts ideas into successful products or processes. As a result, many of the same skills such as exploring, mentoring, planning, organizing, scheduling,
controlling, communicating, and leading could be used in both careers with minor modification. Dealing with people is always difficult and requires great skill. This is especially true when dealing with students. Many students are in a class not by choice, but simply because it is a requirement for graduation. In some cases, these students are uninterested in the subject, unmotivated, and quite simply bored. However, relating the subject matter directly to real world industrial and consumer applications tend to spark their interest. Actual products involving automotive components, robotic equipment, embedded systems, electronic appliances, construction project and computers are extensively utilized in class. Most of these examples illustrate the importance of actual industrial experience and how it could be effectively used in the classroom. Using this applied approach improves their interest and seems to work in almost every instance. In many cases the quiet, uninterested, and reserved students actually become motivated and productive members of the class.

Some Suggestions based on Project Managements’ Principles

All or some of the project management principles are applicable to becoming successful in academia as well as applicable in the industry (Loendorf, W. R., 2006). These seven skills include: planning, project management, problem solving, presentation, patience, persistence and reflections are noteworthy in their own right, but collectively, they are essential for success as an engineering educator.

Planning.
Perhaps planning is the first and most critical of the skills. It is the initial phase of preparation for any project. Most jobs and assignments can be considered as a project that need to be managed including teaching a course, running a committee, writing a research proposal or preparing curriculum. Planning involves every aspect of developing a project including a schedule or timetable right up until the actual work begins. It requires a careful thought process to include every aspect of the activity prior to starting its operation. It creates a calendar for the academic term that is detailed that needs to be done, and should be easy to follow.

Project Management.
Once the planning has completed it is time to begin the management process for its implementation. Project management is the coordination of activities necessary to complete in a timely fashion in order to reach an objective. Most projects involve a set time frame or temporary duration to form a product, process, or service. All of these aspects directly apply to the management of a course or committee. For example, during the academic term the activities related to a course must be scheduled and tracked to insure they are completed, resulting in the transference of knowledge. Everything is documented right from the start inform the students and committee members exactly who is doing what and when it is due avoiding a great deal of confusion. It requires more upfront work but returns dividends during the entire academic term or year.
Problem Solving.
No matter how well a faculty plans and manages, unforeseen problems always arise. They can surface anytime but typically appear at the worst of times. Luckily, E and ET are trained to think in a logical and rational manner to consider all possible alternatives before making the final decision. This is an easy process for problems involving inanimate objects but quite difficult when people are involved. While working with a wide variety of individuals and problems on project teams in the industry, significant experience is gained that is directly applicable to the academic endeavor. Granted, many of the problems in academia are different than those from the industry, however, the fundamental solution process can still be applied. For example, many E and ET enjoy working alone on projects and often excel in their work. One approach that is successfully used in the industry is to utilize this expertise in a team setting where their contributions would be significant. This increases their comfort level and has the tendency to draw them out of their shell. This same approach can be utilized with student project teams with equal success. Sometimes students are shy or just unsure of their abilities; however, the results are simply impressive with taking leadership positions in subsequent teams.

Presentations.
The ability to present material in a clear and concise manner is another valuable and required skill. Some speaker talks in a monotonously, too fast, or too slow while looking at the whiteboard and ignoring the audience. Although faculty is thrilled when it’s over, students remember nothing from the lecture. This is even more prevalent today with Microsoft PowerPoint presentations full of slides with too much information written too small and simply read by the speaker. Presentations must be fun and interesting in order to keep the audiences’ attention so that students should not get bored and lose interest easily. Unfortunately, there is not one universal solution rather a great deal of work is required to keep the lectures fresh and entertaining. Entertaining lectures and presentations can be treated as a show, using a wide variety of techniques to keep students’ attention and interest. This, of course, means more work for the instructor but a wonderful side benefit is relieving the tedious task of presenting repetitious lectures.

Patience.
One of the most difficult skills to master is patience. Our society wants everything now and is unwilling to wait for anything. In industry, for example, some E and ETs continually go to their manager for advice on every little detail involving their work without relying on their trained judgment. This is equally true for education. Students want to understand and master the material without delay using as little of their effort as is possible. Students don’t take the time to read and study the textbook or complete the required homework assignments. They expect to understand all of the information they need directly from the class lectures. When students realize that this is not happening, they visit the instructor and spend time trying to catch up. This is a continual source of frustration for the instructor and requires them to have calmness and self control. The instructor must be willing to endure the inconvenience without complaint. Office hours are scheduled to aid those students having difficulty with the course, and in many cases, this takes a great deal of time. One of the greatest thrills for a faculty is to witness a student as
they finally understand how to solve a problem and sense their feeling of accomplishment. This is what education is all about, but it requires a great deal of patience from the faculty member.

**Persistence.**
This is a critical skill that must be acquired early by the E and ET as well as the new faculty. In industry, problems occur all of the time requiring changes in plans and strategies. For example, while developing an embedded system in industry, it was discovered that both processing and memory requirements would greatly exceed the available capacity of the microcontroller selected. Cost constraints wouldn’t allow for more memory or a more powerful computer. Many alternate solutions to overcome the problems were tried without success, until finally, a new radical set of thoughts, algorithms and data reduction techniques resolved the issue (Loendorf, W.R., 2006). Through persistence the problem was rectified and the project successfully completed. The same traits are equally valuable in the academic world. The learning curve is steep, requiring the new professor to remain firm and steadfast as the transition unfolds. As with any career change, a period of rapid change offers strange and unfamiliar circumstances that must be dealt with. There will be numerous obstacles, setbacks, and disappointments along the way. However, faculty should not become discouraged; it is all part of the learning process. They should not give up but rather try more new things, and evidentially, they will begin working. The key is to learn from each experience and build on every success no matter how small those are. Evidentially, the successes will overwhelm the mistakes, creating a solid foundation for future endeavors.

**Reflections.**
Faculty need to be reflective after each lecture, activity and even after each semester. Faculty needs to find why the chosen syllabus is good or not, what worked and didn’t work for this lecture and why, what can be done to make it better. Publications and course materials can be annotated to clarify what the new faculty is trying to accomplish whether he or she thinks those attempts are successful, and how he or she might do things differently in future.

**New Faculty Members: Common Errors and Success Strategies**

Boice (1992) found that 95% of new faculty members make certain mistakes that cost them time, productivity, and sanity. It typically takes them 4–5 years to become as productive in research and as effective in teaching as they ever become. The other 5%—the “quick starters”—meet or exceed their institution’s expectations for research productivity and score in the top quartile of teaching evaluations in their first 1–2 years on the faculty. Boice found things the quick starters do that the other new faculty doesn’t do, and he also found that those strategies can be effectively taught.

Most of us on college faculties learn our craft by trial-and-error. We start teaching and doing research, make lots of mistakes, learn from some of them, teach some more and do more research, make more mistakes and learn from them, and gradually more or less figure out what we’re doing. Sometimes small changes in the ways we do things can yield large
benefits. We may eventually come up with the changes ourselves, but it could help both us and our students immeasurably if someone were to suggest them early in our careers. Here are some suggestions I wish someone had given me during my early career which are important to become successful. Some of the ideas and thoughts are taken from Felder et al 2012.

*Over preparing for classes.* Spending more hours or more preparation for each lecture hour with complete and accurate notes equating good teaching is not true. Faculty need to understand too many materials, rush to cover the syllabus, little time for questions or activities in class, or little time for anything else will not bring the best outcome of learning. In the first year of my faculty, the author learned from this mistakes because too much contents of materials resulted less learning outcome. Less material to cover means more time to cover specific materials will result in better learning, and less preparation time means more time for research and personal life. The strategy should be to limit preparation time for class, especially after the first offering.

*Put time where the priorities are!! Giving proposal and paper writing the highest verbal priority while spending relatively little time on them and producing relatively little.* Concentrating on the most pressing tasks (e.g., preparing for tomorrow’s class) and waiting for “blocks of uninterrupted time” to do the “real writing” is not a good idea (Felder, 2012). It will produce a lack of productivity, and anxiety. In that case, one strategy would be to make an appointment with yourself, work away from the office, free write first, then revise and keep a time log for a week to see how much time is spent on nonessential activities. Regular sessions will maintain momentum (less warm-up time) to produce steady progress.

*Working non-stop and alone.* Sometimes, faculty will fail to get available support and learn faculty culture that leads to isolation and depression. A good idea is to visit colleagues; go to lunch; have a cup of coffee with colleagues in and out of the department; discuss research, teaching, and campus culture. If you’re facing a specific problem, such as writing a paper for a journal with a high rejection rate, approaching a tight proposal deadline, dealing with an unproductive graduate student or a rebellious undergraduate class, find out which colleagues are likely to be helpful and seek them out.

*Working without clear goals and plans and accepting too many commitments that don’t help achieve long-term goals.* Faculty need to make commitments wisely and develop clear goals and specific milestones for reaching them. Periodic feedback from the department head and peers can also be helpful.

**Others Suggestions**

*Find one or more research mentors and one or more teaching mentors, and work closely with them until you become successful.* Most faculties have professors who excel at research or teaching or both, and are willing to share their expertise with junior colleagues, but the prevailing culture does not usually encourage such interactions. Find out who these individuals
are, and take advantage of what they have to offer, if possible, through collaborative research and mutual classroom observation or team-teaching.

**Find research collaborators who are strong in the areas in which you are weakest.** If your strength is theory, undertake some joint research with a good experimentalist, and conversely. If you're a chemical engineer, find compatible colleagues in chemistry or biochemistry or mathematics or statistics or materials science or environmental engineering. If you are in construction management, find somebody from civil engineering or architecture or material science or even industrial engineering. You will come out with better research in the short run, and you will become a better researcher in the long run by seeing how others work and learning some of what they know.

**When you write a paper or proposal, persuade colleagues to read it and give you the toughest critique they're willing to give.** Then revise, and if the revisions were major, run the manuscript by them again to make sure you got it right. Then send it off to the editorial board. Because of that acceptance rates will definitely go up.

**Learn to identify the students in your classes, and greet them by name when you see them in the hall or on campus.**

**When you're teaching a class, try to give the students something active to do.** Only talking in the class will lose students’ attentions within a short period of time—students get drowsy or bored or restless, and start reading or talking or daydreaming. The longer the lecture, the more of them you lose. Forcing them to be active, even if it's only for 30 seconds, breaks the pattern and gets them back with you for another 10 to 20 minutes.

**Prepare an outline for each of your classes.** The analysis necessary to prepare a course outline helps the faculty to determine the rules of law applicable to the subject matter of the course, as well as determine how the rules relate to one another. If you do not go through this process, you are less likely to master the subject matter. Also, not all faculty teach a subject the same way. In fact, many faculty do not even teach a course the same way from one year to the next. The only way to get an outline tailored to your course is to make it yourself whenever a topic is completed for presentation.

**After you finish making up an exam, even if you KNOW it's straightforward and error-free, work it through completely from scratch and note how long it takes you to do it, and get your TAs to do the same if you have TAs.** Then go back and get rid of the inevitable bugs and busywork, make sure most of the test covers basic skills and no more than 10–15% serves to separate the A's from the B's, and cut down the test so that the students have at least three times longer to work on it than it took you to do it.

**Grade tough on homework, easier on time-bound tests.** Frequently it happens in reverse: almost anything goes on the homework, which causes the students to get sloppy, and then they
get clobbered on tests for making the same careless errors they got away with on the homework.

*Create some private space for yourself and retreat to it on a regular basis.* Pick a three-hour slot once or twice a week when you don't have class or office hours and go elsewhere—stay home, for example, or take your laptop to the library or Starbucks, or sneak into the empty office of your colleague who's on sabbatical.

*Don’t reinvent the wheel.* Identify a colleague who is a good teacher and has taught the course you’re preparing to teach, and ask if he/she would be willing to share course materials with you. In my experience, most of the faculty members would be fine with that request. In addition, try finding the course from Open Courseware Web sites such as <http://ocw.mit.edu> and download materials from there. Open courseware may contain visuals, simulations, class activities, and assignments that can add considerably to the quality of a course and would take you months or years to construct from scratch.

**Conclusions**

It is very important to bring the industry and research experience into the classroom. Utilizing real world projects to directly exhibit how theory has been applied in the past to solve problems or create new innovative products will have better students learning. Examples and applications add new dimensions to the classroom experience; incorporate it whenever and as often as possible to demonstrate the usefulness and applicability of the material being studied. Students are interested in how what they learn can be applied in their future. Share your engineering experiences as often as possible in the class.

Faculty need to become as flexible as possible and shouldn’t be afraid to try new things. Experiment with new teaching techniques to excite the students and enhance their learning experience. There is no such thing as failure, just approaches that don’t work very well. Modify it and try again or move on to something else that is new and might work. E and ETs have always experienced things that didn’t quite go as planned leading to discoveries that usually do.

Effective management of your time is critical. Preparing for classes, committee work, and all types of unscheduled interruptions will consume the work day. Just trying to keep pace is difficult and often means staying at school late into the evening. Prepare a daily schedule that outlines when and what you plan to accomplish. It is important to become specific and realistic in the time allocated for each task. Time for interruptions must be factored into the schedule as well. At first this will be a difficult task, but over time experience will better dictate the planning process.

Selecting of a mentor from among senior faculty, collaborating with others on teaching and research, keeping a positive attitude, and finally, balance and moderation in all things are important criteria to become successful in the E and ET academic career. At the end, I would like
to mention that some of these suggestions will work while others may not, based on the faculty’s personality and way of implementation, but it’s always good to try.

References


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