New Engineering Faculty For The New Millennium

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Abstract

Three new faculty members team up to relate their experiences moving from industry to academia. Major topics include teaching, laboratory development, service, publishing, and the balancing of time among these areas. The teaching area includes incorporating industrial experiences into classroom preparation and making the transition from industrial presentations to academic teaching. Bloom's taxonomy is used to prepare for teaching and also to assess learning. Laboratory development includes making that first contact with prospective industrial partners and writing a grant proposal. The service area includes not just the committee work upon which academia thrives, but also outreach activities to the community. This outreach includes both working as a consultant and reaching out to possible new students. Publishing includes the research and preparation of a first paper for conference presentation along with the relative worth of different venues for a published paper. Finally, the fourth member of the team, one who made the move from industry eight years ago, describes how to put these activities into a winning promotion and tenure document. Insights are given into the promotion and tenure process and the various committees that are involved in this process. This document and process are important because it is necessary to not only to become active in all the areas listed above, but also to document these activities in order to achieve tenure and stay in academia.

The New Teacher

In industry, I have served many roles, from team member to technical lead. I have worked in groups of five to 250, and have over fifteen years of experience in the Information Systems industry. This has given me a good foundation from which to teach, but I quickly found I was missing one key element: presenting to an audience of students.

In the first semester of teaching, I was given two classes to teach. The first was an introductory course in Information Systems (IS) with 200 students and the other was an introduction to Structured Query Language (SQL) with fifty students. In teaching the class on IS for just one week, I found I had some problems in conveying information to the students. Most of the problems dealt with the large class size and the room in which I was presenting the material. Some of the students were unable to hear me. To resolve this, I tried using a microphone, but finally found that speaking much louder and moving around worked the best. This allowed me

to keep the students attention better and also aided in keeping the noise level down since the students were quieter with me standing next to them.

The next obstacle was to find the correct tool for displaying information so the whole class could read and understand it. After experimentation with different media from whiteboards to overhead projectors, I finally decided that a digital projector system hooked up to the computer was best. There was less distortion from the projector and information could be presented in large bold text. The presentations were also enhanced by better graphics, and the ability to use color added an additional dimension. Another benefit also occurred, as the large font size limited the amount of textual information presented and this increased comprehension while allowing me to move around the classroom.

The large size of this class was, in part, due to the fact that the students where from several different majors within the university. This provided a challenge in that not only where the students coming with different levels of experience and backgrounds, but were also looking to gain a view of IS that applied to their major. A student in Computer Technology is looking at the tool he/she will use and create as an IS professional, and a management major is looking at understanding what tools he/she can use in decision making. The students had little interest in the parts of the course that did not apply to their major. This is one place where having industrial experience really helped. I was able to give real life examples of my own successes and failures to show them how applying IS can change situations in both the information systems and management areas.

The transition from industry to education was interesting. In the process I learned that I needed to approach the presentation of information from the eyes of a student. Students are interested in gaining skills to be applied and theoretical background knowledge. An industrial teammate, however, usually needs immediate information and skills to do their job better. Helping me in this transition was the university center for teaching, which ran short courses for new instructors.

Assessment

Assessment did not mean much to me when I came to Purdue. I soon learned, however, the importance of assessment and the assessment process. The total process seeks to achieve two things. These are to ensure that the education our students receive is continuously improving and that we as a school receive accreditation. This gives our students the knowledge and skills they need and the recognition in the marketplace that these students are of the highest quality.

Our department has broken down the assessment model into two levels that need to be fulfilled in order to reach the desired level of achievement. First the curriculum is structured so that the student achieves the appropriate knowledge and abilities for the degree they are seeking. Second the content of each course in the curriculum is set in succession to build this knowledge and experience. The life cycle of each level is broken down into four parts: setting goals, delivering instruction, assessing learning, and making corrections.

In setting goals for the coursework we applied Bloom's[1] cognitive learning model The following table briefly describes Bloom's six levels of learning.

Bloom's Taxonomy of Cognitive Objectives

Level 1: *Knowledge*: Student can recite, recognize and differentiate facts on a given subject.
Level 2: *Comprehension*: Given cues, students can paraphrase, translate, interpret, extrapolate, and otherwise use facts.
Level 3: *Application*: Without cues, students can appropriately apply facts to solve problems in new situations.
Level 4: *Analysis*: Students can define the relevant components of new abstractions.
Level 5: *Synthesis*: Students can synthesize the organization, development, and appropriate usage of new abstractions.
Level 6: *Judgement*: Students can evaluate the effectiveness and efficiency of alternate syntheses.[2]

Each goal in each course is assigned a level of Bloom's Taxonomy according to what should be achieved for this course in the curriculum. Then in delivering instruction, we seek to fulfill the goals we have documented. We use the following mechanisms to evaluate instruction throughout the semester:

1. Quizzes will be used to encourage students to keep up with the reading material, or assess incremental learning.
2. Examinations will be used to assess that students have developed an appropriate understanding or mastery of conceptual foundations, essential terminology, high-level methods, basic techniques, and fundamental tools.
3. In-class and homework exercises will be used to assess that students can apply basic concepts and techniques to small, structured problem solving activities.
4. Laboratory exercises and practicals will be used to assess that students can independently apply the technologies used to reinforce problem-solving techniques.[3]

In assessing the learning we have imparted to our students we go back to the goals we set and see to what degree these goals have been met. We do this by looking at the areas in which the students have achieved high scores to make sure the level of objectives is high enough, and also, for those areas where the students have performed poorly, we check to insure that we are conveying the proper information in the proper manner.

The final part of the cycle is to apply corrections to the process so that the next assessment cycle is improved. This was the major topic at the departmental retreat in May, 1999. The interesting thing I have found in going through this process once is that the corrections we make come in several areas. What information we convey to the students is important, but there is an additional need to teach to the level of experience within each class. The other thing that goes with this is that we need to continuously evaluate the mechanism we use to measure the progress of the students. We are gaining new technology everyday through which we can communicate with the students and also evaluate the graded materials from the students. Lastly, student evaluations, assessment methods and the course improvements can be documented and entered in our promotion and tenure document.

Lab Development

Shortly after accepting an appointment as a visiting instructor with Purdue's Department of Technical Graphics, one of my colleagues provided me with a list entitled "suggestions for achieving tenure." Number four on the list said, "Obtain at least one grant per year." I decided to first review the literature and see what other academics had to say on the subject, and then to pursue obtaining grants of my own.

I found laboratory development to be a service activity that links industry and the University in a symbiotic relationship that delivers research, training, and personnel to industry while bringing resources in the form of grants to the University. It's critical for us to see laboratory development as an exchange of resources. Both sides gain something, even if not always tangible. Industry gets access to education and training, research findings, prospective employees, and even gains some brand recognition.[4] Meanwhile, grants provide the university with access to equipment and personnel not easily found on academic grounds. With increasingly tighter budgets for higher education, grants are a way to bring in resources that would be outside of departmental budgets. Brunn[5] tells us that "evidence of receiving extramural grants … and of seeking such funding" is one of the criteria he considers when deciding whether or not to support tenure. The importance of grants to the University are best characterized by considering the 1987 case in which "Leaders of British universities promised to tighten tenure requirements, raise academic standards and increase the institutions' managerial efficiency in trade for a 7 percent increase"[6] in governmental grants. The university values monetary gains and values those who get grants.

In forming an argument for procuring a lab development grant, we need to consider what the university can offer the prospective donor. The realization that we are not asking for handouts is the guiding principle for success. The argument needs to be more than just "Please give us A, and you can claim it as a donation on your company's taxes." With thousands of prospective academics contacting thousands of companies asking for donations, a successful argument needs to stand out. By formatting the argument as follows, success is more likely. "If you provide us with A, we will be able to do B, which will benefit you in C." Using this as a template, I decided to approach a software company named Newtek. My primary argument was, "If you provide Purdue with lab copies of LightWave 3D, we will integrate it into our animation classes and, when our students graduate, they will have been exposed to LightWave instead of just Kinetix's 3DS Max, your major competitor's package." I augmented the argument by providing details concerning the Technical Graphics curriculum to include the number of classes, students per class, past employment demographics of recent graduates, current hardware and software set-up, etc. I also highlighted my professional experience using their product to animate the current television opening for the Chicago Bulls. Newtek's Director of Educational Sales contacted me within days to ask how many copies were needed.

To my surprise, I had to check with Purdue's central gift department before accepting this offer. Each university has a different name for this, but within most universities there is an office responsible for coordinating university-industry relations. This minimizes the possibility that

faculty members from different departments represent conflicting interests to the same donor. After receiving any donations, it is important to follow-up with the donor by sending examples of work done by students with the donation, web page addresses, newsletters, and even thank you letters. In the end, I found that by approaching grant acquisition as a win/win business relationship, companies are more willing to contribute grants.

Service

My industrial experience conditioned me to always think of the bottom line. At the companies that I had worked for previously, everything was done for some gain. So, I was intrigued by the concept of service as part of my employment. My first inclination was to turn to the literature to find the answer to two questions: (1) what counts as service, and (2) how will my superiors view my service activities in the long run?

My search revealed that while service activities can assist promotion and tenure by increasing visibility, it is not a deciding factor in whether to grant tenure or not. Shifflet and Patterson[7] tell us that "of all the activities that faculty are required to adopt at the university, this [service] is probably the one that is least regarded and acknowledged, but is often the most time consuming." They further tell us that "Many junior faculty members tend to take on too many service activities without evaluating the consequences of their actions until it is too late."

"That's me", I thought. Some how I had ended up on recruitment presentations at five high-schools, advising all TG students on my campus, sponsoring a student organization named TechFX, designing a new TG course on Technical Directing, serving on our computer systems committee, and serving as the layout editor for our departmental newsletter. "Is it too late?" I thought. "Am I doing what I'm supposed to be doing?"

According to Dean Marsh from the University of Chicago " the role of the professional school is precisely to develop and disseminate the knowledge and analytical tools to enable practitioners to reduce uncertainty and to evaluate professional responsibilities effectively."[8] In this world, the scholar is responsible for developing knowledge --- research --- and disseminating knowledge --- teaching. There is little or no time for anything else, including service. Marsh further tells us that the typical responsibilities of a faculty member should be 50% research and 50% teaching. Brunn concurs, little or no time is to be devoted to service. He tells us that "the general model is 50% instruction, 40% research and 10% service."[5] Collins found that most nontenured faculty are reluctant to work on service activities outside of their campus because of the pressure they feel to publish by the tenure committee.[9]

If service is so insignificant in comparison to scholarship or teaching, why engage in it at all? Would I not get a better return on my time spent by putting it into scholarship instead of service? Shifflet and Patterson provided the answer. "These activities [service] are important to establish a network of support and visibility."[7] Service at the university level enhances a faculty member's visibility among those who might be making decisions on tenure and promotion. Service in professional organizations provides the faculty member with contacts outside of his/her department. This is critical because when it comes time to be reviewed for tenure, most

universities ask that faculty submit a list of names of "peers (not including advisors or colleagues with who[m] they have published) in their field of expertise who will evaluate their work."[7] A second reason is, quite simply, students. Activities in the middle and high schools can increase our enrollments by showing younger students the fascinating parts of engineering and technology. If we are faced with declining enrollments, this can become very important.

As seen above, service in the community can serve a variety of purposes, but most notably it can serve to dispel the accusation that faculty in research universities are "more interested in developing new technologies than in helping local companies use them."[4] In the end, I was led to the conclusion that "service is important, but the consensus is that it is much less important than publication, grants, invited presentation, awards…"[5] when it comes time for a tenure review.

Scholarship

When I made the transition from industry to academia last year, the concept of tenure at first appeared to be similar to the probationary period most employees have experienced in the business world. Upon closer inspection however, it became clear that this process is much more. Although the process includes appraisal through the assessment of teaching capabilities and the review of service activities, the corner stone for achieving tenure in most universities is based on scholarship. This is because the primary role of the university is to foster learning. "If it is to be of the 21st century, it [the university] must continuously be pushing forward and outward its scholarly frontiers. The university is an anachronism if it puts its graduates into the modern world with only the information of yesterday."[10] This is why publishing is a necessity in building credibility with colleagues and students, and why scholarship is most often the determining factor in the tenure decision.

Through my research, I also learned that the relationship of scholarship and tenure does not end once tenure has been achieved. Just as there is a direct link from research and publishing to tenure, there is also a link from tenure to subsequent research and publishing. One of the main purposes of tenure is to ensure that professors have the academic freedom needed to pursue scholarly work and publish findings that might be considered controversial. Thus it has a "balance of power" role within the university, allowing professors to explore scholarly areas that may be unpopular without fear of reprimand or loss of employment.[11]

Once the importance of scholarship is established, the new professor must next choose an area to research. One advantage of having worked outside of academia is the exposure to ideas for research that are of interest to a particular industry or business. This outside exposure may also provide familiarity with the body of knowledge available on a specific topic and sources for further research. It is important to choose an area where there is opportunity to ultimately add to the available knowledge base, even if the initial publication is more or less a restatement of known information. It is also important to understand that some universities place a higher value on research articles associated with the teaching methodology of a given subject matter rather than on the subject matter itself.

The research process can take many forms. The university library is a good place to start, but the trend toward online research via the Internet has opened the door to many new sources for the university researcher. Internet sites like ERIC (the Educational Resources Information Center) developed by the National Library of Education and THOR (The Online Resource) which helps you navigate through materials in Purdue University's research libraries are just two examples of the new age of research. In addition to this, the many Internet search engines available today can be used to pull in appropriate references that are scattered across the World Wide Web. The challenge with these search techniques is to be able to manage the information and determine which resources add value to your project.

Publishing

As the research effort progresses, invariably the issue of whether or not to write a textbook arises. Certainly, there is much prestige and accomplishment associated with publishing a textbook. However, the new professor needs to understand the high risk involved with this undertaking. It is like putting all your eggs in one basket in terms of the tenure process. There is no credit granted for all the work put into a textbook if it is not published. For an equivalent amount of time and effort, the researcher may be able to produce a number of research papers, essays, and articles, and have a much better chance of getting many of them published. If the decision to work on a textbook is made, it would be prudent to collaborate with a senior partner who has textbook publishing experience. If you have any doubts though, publish articles instead of textbooks prior to tenure. [12]

Finally, the researcher needs to decide where to submit work for publication. To address this issue, it is a good idea to start with reference materials from your department within the university. Not all publications and/or conferences carry the same weight in terms of perceived value by academic colleagues. Organizations and publications that were important in industry may or may not be recognized by the academic world. The researcher needs to find out which publications carry the most weight with the faculty tenure committee and submit work to these organizations. Most universities will find the following publication venues acceptable (providing the sponsor organizations are deemed acceptable): refereed journal articles, reviewed journal articles, refereed conference proceedings, reviewed conference proceedings, and conference presentations.[13] However, the "scholarly value" associated with the various publishing venues looks something like this, from highest perceived academic value to lowest:

Refereed scholarly journal (the more prestigious the better),
Refereed professional journal or book,
Book chapter,
Non-refereed semi-professional periodical or textbook,
Conference proceedings, essay collection,
Semi-technical general-circulation magazine,
General-circulation magazine or newspaper,
Radio or TV documentary.[14]

In addition to these traditional avenues for getting scholarly works published, electronic publishing is emerging as a medium for publication as we near the new millennium. Since it is relatively new though, "… scholars worry that publication exclusively in an electronic format would not carry the same weight in tenure decisions as publication in print."[15] However, as the prestige of online publishing improves through the reputation of the publishers and editorial teams, this medium will become more acceptable to the academic community and more appropriate for scholars on the tenure track.

In conclusion, scholarship and publishing are critical issues for the new professor and this is not likely to change in the next millennium. They are essential elements in the tenure process that help prove the worth of professors to both colleagues and students. And finally, if approached properly, the research and publication skills that are developed through the process of tenure can become the model for continued scholarship throughout an academic career.

The Promotion And Tenure Process

Promotion and Tenure are usually mentioned in the same sentence. I have learned, however, that they are quite different. Promotion is the rise from one academic rank to another. These ranks are assistant professor, associate professor, and full professor (or simply "professor"). Tenure is the achievement of a "permanent" position, one in which there must be "just cause" for dismissal. The tenure system is undergoing change, however, and it is projected that "Few colleges will eliminate tenure in the next 15 years, but many will become stingier about offering it and more creative in finding alternatives to it."[16] This is one reason that the probationary period for a new professor is so long. Generally, the procedure is to hire a new tenure-track employee at the assistant professor level and award tenure upon their promotion to associate professor. There are cases of being hired as an associate professor and / or being tenured in rank, but these are exceptions.

For any new professor, the entire promotion and tenure process may be the least of his or her concerns. Quite simply, sometimes it is a big enough task getting prepared for a class that starts in seven minutes, let alone worry about a promotion and tenure process that can take seven years. In addition, service, in the form of all the "little" jobs given to us by our managers when we feel that we cannot say "no", sometimes takes an inordinate amount of time and distracts us from the long-range future. The clock, however, starts ticking immediately. Generally a new assistant professor is put up for promotion to associate professor and tenure in their fifth year. If not successful on this first try, there is sometimes a second chance in the sixth year. Depending upon that decision, the seventh year is then spent as a tenured professor or as a seeker of alternative employment

It is thus imperative to understand the process for promotion and tenure. The process and standards will probably be documented in a school or university manual that you should try to immediately acquire. This manual should include a standard upon which professors will be judged and a step-by-step process. The standard is often open for interpretation. For example, "A candidate for promotion to Associate Professor should have a significant record of accomplishment as a faculty member and show promise of continued professional growth and

recognition."[17] While the definition of "significant" may be vague, the process is usually quite defined. This process may even be diagrammed for you in the manual. If not, it would be a good idea to diagram it yourself, then review it with others to make sure that you have it correct. Looking at the diagram, you will quickly realize there will be several committees that will decide your fate, each one further removed from your departmental colleagues. Since each committee will include fewer people who know you and your deeds, two items become immediately apparent. First, you better be on good terms with your department head or dean as he or she will be presenting your case to the committee. Second, your promotion and tenure document is very important; as it is your voice within a committee meeting that you will probably not be allowed to attend.

The Promotion And Tenure Document

Basically, the promotion and tenure document should tell a story of personal development and achievement in the areas discussed above. Although it is meant for tenure-track employees, it also has a use for non tenure-track employees. A visiting professor position, for example, is usually available for only two or three years, then either the position is terminated, another visiting professor is hired, or a full search and screen procedure is initiated as the position transitions to tenure track. In the latter case, having a document detailing the activities of the time as a visiting professor can help while seeking the full-time position. In the case of someone hired to mainly teach classes, the document is not used for any sort of tenure process. People in this situation, however, must still be evaluated. In this case the document becomes a Curriculum Vita (CV) detailing the accomplishments of the individual. By being in the same format as the promotion and tenure documents, the CV can be easily understood by those who must evaluate that person, and can be used by the employee as a point of departure for any goal-setting meetings. In both tenure-track and non tenure-track situations, the document should be part of an annual review. Using the document as a starting point is a good way to assess your personal accomplishments and set goals for the new year.

The format of the document is very important because it reflects the values of the school granting tenure. Therefore it is a good idea to find the sample format in the promotion and tenure manual described in the previous section and create the template for your own document. If you can, get a copy of someone else's document, preferably someone who has just achieved tenure. You may be surprised that the stated value of your organization does not match the actual values. Do not worry if it contains lots of accomplishments compared to yours, they have already been through the process, you are just beginning. You must start immediately, however, as it will be almost impossible to create an entire document, often 20 pages in length, in only your fifth year. Thus you should immediately create your own document file folder, and, as things occur over the year such as teaching evaluations and conference attendance, put a note in the file. Then, by using the sections of a successful document as your guide, create the template for your own success.

Generally there will be four sections in the document. The first, a general introduction, will often list a person's previous academic and industrial experience and other background information. Then comes the more important parts, the major sections for teaching, research,

and service. Note that publishing is not directly listed. That is because publishing can be in all three sections. Either we are publishing in support of teaching, publishing our research that adds to the base knowledge in our field, or publishing in practitioner journals and conferences. In schools with a teaching emphasis, the document may have only two sections, teaching and service. Scholarly publishing is still required, but the focus is changed away from pure research towards teaching. Gifts and grants are also important. Again, however, the focus is different. For teaching institutions, the development of teaching laboratories is most important. For research institutions, research grants that bring money and prestige to the department take the fore.

Summary

As faculty members, our mission is thus to determine what areas are important to our schools and determine if these areas fit into our own personal value system. If they do, we have to start or to continue developing in those areas. We must also start or continue a promotion and tenure document that displays our developments and enables us to continue teaching in the new millennium. It is important, however, to remember that just as a proper balance of the areas above is needed for a successful professional teaching career, a balance is also needed between our professional and personal lives.

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