STAYING CLOSE TO YOUR STUDENTS DURING THE TENURE PROCESS

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Abstract

The road to tenure has many challenges, and because of these, it is easy to lose track of one of the primary reasons many of us have chosen to be professors: the opportunity to make a difference in the lives of our students. There is no shortage of advice for new professors on how to proceed to tenure. Repeatedly, new professors are told to limit teaching time and to focus on the goal of published research. Given the limits on a new professor's time and energy, this is good advice. However, it is likely that the path new professors learn early in their academic career will be the path they will follow through the rest of their career. Because of this, it is essential that the value we set on teaching be clearly identified and supported throughout the tenure process. It is unlikely that the demands of research and service will lessen following tenure. If we do not make time to pursue teaching excellence during the tenure process, it is likely that we will not find time to pursue teaching excellence following tenure. Both our students and we lose if this happens. Recognizing the importance of teaching, some universities have begun to change the tenure process to more clearly recognize excellence in teaching. However, even in these cases tenure is a demanding process, and it is easy to give in to time pressure and lose track of our teaching goals. This paper discusses the importance of staying close to the students during the tenure process and provides a series of suggestions on how this can be done within the limited time available.

1. Introduction

The call for change in engineering education has become so widespread that it is nearly a cliché. Studies, conferences, papers, and institutes all call for changes in engineering education. The American Society for Engineering Education[1], the National Research Council[2], the National Science Foundation[3], and the Engineering Deans Council[4] have all issued reports on engineering education. New models of education, new content, and new ways to teach are all "on-the-table." These are exciting times for those who are starting a career in engineering education. We have the opportunity to participate in the implementation of ABET 2000[5]. We have a wide selection of teaching tools available, ranging from traditional books and lectures to computer and web based instruction. We have the focus and attention of a wide range of university, government, and professional organizations that want to support and improve engineering education. In many ways we have the wind at our backs in the area of engineering education. And yet, it easy for us to become distracted with research and to become disconnected from our students. Teaching and research are both key aspects of an engineering professor's responsibilities and both compete for the time and attention of the new engineering professor. Because of the demands of the tenure process, research often receives greater attention than teaching. This occurs for many reasons. However, chief among these is that the evaluation of a faculty member for tenure is based

primarily on evidence of scholarship in the faculty member's work. The key requirement is that the faculty member "present evidence that creative intellectual work was validated by peers; communicated to peers and broader audiences; recognized, accepted, cited, adopted, or used by others. In other words, that it made a difference."[6] This scholarly work can vary in that it can include teaching, research activities, and professional practice. However, it is required that "evidence that a significant portion of a faculty member's scholarship has been documented (i.e., communicated to and validated by peers beyond the university)."[6] The difficulty of documenting and validating teaching scholarship "beyond the university" generally favors research over teaching in the tenure process. Because of this, it is a challenge to maintain a balanced academic life of teaching and research.

How to stay close to our undergraduate students.

- include undergraduates more fully in our academic lives,
- give more responsibility for learning to the student, and
- set measurable teaching goals, establishing plans to meet these goals, and reviewing progress towards these goals.

The danger lies not in failing to seek a balanced academic life of both research and teaching which results in tenure. Rather, a faculty member's time is in short supply and there are many competing demands. Because of this, the danger lies in losing track of one of our primary goals: to make a difference in the lives of our students. If we lose track of our research goal, it is quickly obvious. Graduate students demand attention, funding dries up, conferences are missed, and papers aren't published. If we miss these signs, the annual or semi-annual update of our vita quickly brings the shortfall to our attention. Blanks in areas such as grants and contracts, refereed publications, and technical presentations are obvious and will be quickly corrected. On the other hand, if we lose track of our students, the classes still get taught and no signal warns us that we are losing track of an area of importance. In most cases a vita barely recognizes teaching, which generally appears only as a list of classes taught. If the student evaluations are tolerable, no one questions our teaching involvement. When time is in short supply, it is easy to let our connection to undergraduate students float until "next year."

Recognizing these barriers to staying close to our students, how do we overcome them? How do we become the professor/teacher who students remember as making a difference? Methods that can help us stay close to our students include:

- Seeking interaction with undergraduate students within multiple forums and moving beyond the classroom and office hours as the only opportunity for interaction between undergraduate students and professors.
- Sharing teaching and learning responsibilities with the students.
- Developing clear goals for our undergraduate teaching and then setting aside time to assess our progress towards these goals. Additionally, developing a means for including our progress in the area of undergraduate teaching as a part of the tenure package.

These suggestions are not "time savers" but rather ways to more productively invest ourselves in our students lives. The goal is not to reduce our teaching time and limit our involvement with

undergraduate students, but rather to become fully involved with our undergraduate students within the constraints of our time and energy.

2. Interaction within Multiple Forums

The work of the professor occurs in many forums. Teaching consists of preparation, lectures, classroom work, homework, exams, grading, office hours, and more. Research includes literature reviews, proposals, construction of test devices, conclusions, conferences, and journal articles. Service has a broad band of concerns including university service and consulting. The college experiences of an undergraduate student occur in an equally broad range of forums. The classroom is only a small part of the undergraduate student's academic life. But in most cases, it is the primary place where the student's and professor's academic lives meet. If this intersection where the professor and student meet can be extended to a variety of tasks, a broader range of materials and experiences can be taught. If the classroom is our only place of interaction with our students, then the range of topics we can teach is limited. Opportunities available beyond the classroom include mentoring programs for frosh, minority student research programs, undergraduate-only research programs, undergraduate research assistants in traditional research programs, laboratory assistants, undergraduate teaching assistants, undergraduate graders, and a host of other opportunities. The common bond between these experiences is developing a personal connection between the professor and the student and enabling the student to participate as a stakeholder in their education. The student still does the class work, still gains a strong foundation in the fundamentals of engineering, but the classroom experience is supplemented and strengthened by working directly with a professor implementing one or more aspects of her/his education. Rather than regarding these experiences as "extra-curricular" activities, these activities should be regarded as "off-timetable" learning opportunities as valuable as the "on-timetable" classes and labs. Many of the desired ABET 2000[5] outcomes are enhanced by "off-timetable" experiences, and some are probably best taught through "off-timetable" experiences. Team work, ethics, professional practice, application of engineering principles, and project management all can come to life when the students work on real projects, with real risks, and real rewards.

The comment most often made about undergraduate involvement in activities beyond the classroom is that it requires too much of a professor's time and that the quality of the final product is often disappointing. During the tenure process there is no extra time and so any opportunity to become involved with undergraduates must pay its own way. This requires that all these activities result in:

- Materials that support the tenure process, and
- Undergraduate experiences that strengthen departmental and ABET 2000 goals, particularly those goals associated with team work, ethics, professional practice, application of engineering principles, and project management.

Successful undergraduate involvement beyond the classroom requires that we cut across the lines between teaching, research, and service. About a year ago I visited a teaching-only institution and was amazed by the wide range of activities that the students participated in, in the absence of graduate students. Lab classes, experiments, and published research were all supported by undergraduate students. Three ways that can be used to extend interaction between tenure track professors and undergraduates include:

- Undergraduate-only research — If an area of research can be set up such that the undergraduates are the prime movers and publishable research is the result, this is an ideal situation. For example, my research interests are in the area of computational modeling and visualization of combustion and power plant systems. Within this broad area I have set aside one research area, the design and modeling of small stoves for developing countries, for undergraduate research. The goal of this work is to develop advanced biomass cookstove designs with significant reductions in harmful emissions resulting in longer, healthier lives for the many people who daily use biomass cookstoves. This work is performed by a group of five to seven undergraduate engineering students who have written research proposals, have set up and tested stoves, will computationally model the stoves, and will publish our research results. The ingredients that will make this a successful undergraduate research project are that the goal is clear, the overall phenomenon is understandable, and the students can setup experiments without excess time and difficulty. Additionally, there is a real need for research in this area, and funding for this research is very limited.
- Undergraduate involvement in research groups — There are a variety of research tasks in which undergraduates can be very useful, for example, helping with the literature search, construction of experiments, preparation of drawings, and helping conduct experiments. It is often relatively simple and cost effective to include an undergraduate research assistant in a proposal. Because these students are a part of a larger group in which the graduate students take the lead, they often require little direct supervision by the professors while still being productive.
- Undergraduate teaching assistants and graders — Using undergraduates as a part of the teaching effort has to be done with care, However, when properly supervised in a well defined and carefully selected teaching environment, undergraduates can be an asset. Undergraduates can assist in teaching lower level lab courses, provide help with class projects, and provide walk-in help sessions. The most common use of undergraduates is as graders for lower level classes. This has the potential to yield several benefits. The student and the professor work together to ensure accurate and fair grading. This requires that the student understand the homework problems and the grading standards. In addition to strengthening the student's understanding of the material, the student is also exposed to the issues of ethics and professional practice. This involvement between professor and student can grow to active mentoring of the student, helping the student to define their goals and encouraging them in their studies.

There are many opportunities in which undergraduates can be more fully integrated into the academic life of the professor. While searching for these opportunities, the following key characteristics of good opportunities for involvement with students should be kept in mind:

- The project/opportunity must build on existing research and teaching interests of the tenure track professor. It is unlikely that sufficient time will be available during the tenure process to start new classes or research areas based only on undergraduates.
- The project must contain real risks and rewards for the professor. If the professor does not have a stake in the outcome of the project, when time becomes tight, the project will be neglected. The students will sense the project is not important to the professor. The lack of commitment, involvement, and supervision will result in poor quality work and disappointment for both the student and the professor.

- There must be an opportunity for the student and the professor to share the responsibility for the project. If the student is to feel ownership of the project, he/she must have the opportunity to make decisions that impact the outcome of the project. If there are no decisions the student can make, then the project will not be a real engineering experience.
- It is best if the project is more than a one-time opportunity. Training students takes time, and it is to the best interests of the student and professor if the project is carried on for two or more semesters. This provides the best return on investment.
- The project should create a product that the student can add to her/his portfolio. The product should be of such quality and of a nature that the student can discuss within the context of a job interview the important and meaningful work she/he accomplished.

3. Share Responsibilities for Teaching and Learning with the Students

Kimon Nicolaides in *The Natural Way to Draw: A Working Plan for Art Study* writes to the student,

> "It is a fallacy to suppose that you can get the greatest results with the minimum of effort. There is no such thing as getting more than you put into anything. You expect a man who is guiding you through the mountains to save your energy and tell you the best way, but you can't get any farther in that mountain than you can and will walk."[7]

In this description, teaching and learning are a shared responsibility between the student and the professor/teacher. The professor is the guide. Knowledgeable in the subject and knowing the terrain the professor can help the students avoid the pitfalls and help them use their time wisely. But the student is the active ingredient. The student travels and explores this knowledge. Too often the professor is seen as the active ingredient, completely responsible for the student's learning. This becomes a significant burden. All the material in the book must be covered. All the homework must be graded. All the students must be made to work. The students become educational mules driven through the landscape of their classwork. Better that they are allowed to become explorers, choosing their own goals within the framework of the class. This places a greater responsibility on the student and provides for closer ties between the professor and student. If you doubt this, consider who is closer, the actor and his/her audience or the coach and her/his team.

The primary concern for this type of interaction between professor and student is the time involved. There is an interesting life planning activity in which the participants consider what is important to

Characteristics of good undergraduate research projects.

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- There must be an opportunity for the student and the professor to share the responsibility for the project.
- The project should be more than a one-time opportunity. Training students takes time, and it is to the best interests of the student and professor if the project is carried on for two or more semesters.
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them and how they spend their time. (i.e. reference 8) Often participants find that there is a mismatch between their priorities and where they spend their time. This is a key exercise for tenure track professors. Time is short and the stakes are high. Where should the limited time available for undergraduate teaching be invested? Does this expenditure of time match our priorities? Within several settings I have asked teaching assistants to list their teaching activities and the time they spend on these activities. Although there is some variation in the lists, they are remarkably similar regardless of the course taught or the class setting. There will be about ten items on the list and of these, grading and lecture preparation will use nearly all the time available. While grading and lecture preparation are important, it is not clear that using most of the professor's time for these two items supports all the necessary teaching goals. One way to look at teaching goals is to consider the ABET 2000[5] student outcomes general criteria. In brief these are:

- Apply technical knowledge
- Design and conduct experiments and analyze data
- Design systems, components, or processes
- Function on multi-disciplinary teams
- Identify, formulate, and solve engineering problems
- Understand professional/ethical responsibility
- Communicate effectively
- Understand the impact of engineering on society
- Engage in life long learning
- Demonstrate knowledge of contemporary issues
- Use the techniques, skills, tools of engineering

Noting that these are program outcomes and that not every class needs to meet all of these criteria, we can still gain some sense of what is needed in an engineering class. It is clear that many of these items must be taught in some manner other than lectures. For example, communicating effectively, functioning on multidisciplinary teams, and lifelong learning are items that must be taught in formats beyond a lecture and that the students must share a portion of the teaching/learning responsibility. While some of these items might be taught using the lecture and grade format, the lecture format may not be the most effective teaching tool available[9]. If lecturing is not always the most effective teaching tool and it uses much of the time available for teaching, the tenure track professor must move beyond it to more effective tools without increasing the overall time spent. Several ways this can be done are:

- Do not cover every topic in the book — Too many classes only repeat the material in the book, section by section, proof by proof, and example problem by example problem. Often the students still take notes of everything on the board and the class is filled completely with lecture. Not everything can be covered unless the pace of the lectures is too fast, risking losing the student's attention in the flood of information. The students know exactly what to expect, the information is in the book, and the interaction between the students and the professor is minimal. Let the students learn some of the material from the book and other sources. Choose the in-class material more carefully and spend the same time preparing the lecture as before. The students will learn more if you cover less in the lecture.
- Assign technical topics or homework problems to the students for presentation — Assigning homework problems to the individual or groups of students for presentation has several positive aspects. Primary among these is investing the professor's time working directly with student(s) instead of investing it in lecture preparations. If managed well, this technique is

time neutral. It does not save time, but it does not add time either. To ensure success, the professor must meet with the student(s) before the presentation to ensure that the problem solution is understood and afterwards to critique and grade the student's effort. If the student is not ready, the class should not be presented with the wrong solution. The presentation should be rescheduled, if possible, or cancelled and the student's effort graded appropriately.

- Provide time in class for groups to meet — Students are busy and trying to pull a group of students together for a group project outside of class can be difficult. Providing some half-hour to hour time blocks in class can ease this problem. More importantly this provides an opportunity for the professor to move from group to group, listening to the students, assessing their knowledge and hard spots, and getting to know them as individuals.
- Bring examples from research and work experience into the classroom and invite students to do the same — The more a professor shares about their professional lives and research interests the less one-dimensional and more open the students will perceive them to be. Additionally, many students have work experience or interests that are applicable to the class. This sharing of experiences and interests can open doors for closer student/professor interaction.
- Use a grader — Using a grader has three advantages. The first advantage is that the professor can work closely with the grader as discussed earlier. The second advantage is that the grader can invest more time each week and, as a result, will generally be more thorough in grading than the professor. The third advantage is that the time that would have been spent grading can be invested in better classroom preparations, more office hours, meeting with student groups, or any other activity that improves teaching and learning and brings the student and professor together.

4. Grade Your Teaching Efforts

If teaching is important and equal in priority with research then it should receive equal billing with research. Yet it is easy when confronted with time pressure to put excellent teaching aside for the moment. If a tenure track professor does not have some method of following teaching progress, it is unlikely that teaching excellence will emerge on its own. Just as there are research goals, there should be teaching goals. The tenure track professor should develop teaching mentors, formulate teaching goals, perform periodic, scheduled reviews of progress towards these goals, and seek peer review of their teaching effort. Without this kind of professional stance towards teaching excellence, we are not serious about teaching excellence. Well-defined goals combined with periodic reviews will provide the mile markers necessary to measure progress and can ensure that teaching receives its fair share of time and attention. Mentors have walked the teaching path before. They know how to save time and they can encourage. Peer review is essential. The tenure track professor may believe that their teaching is outstanding and the student evaluations may be good. But if the professor's teaching has not been peer reviewed it has not met the gold standard of professional academic work. Without peer review, teaching will always be second to research.

With goals, plans, reviews, mentors, and peer reviews in place, how can tenure track professors get acknowledgement for their teaching efforts and what can they present for tenure? A teaching portfolio can summarize all this information. This includes summaries of teaching responsibilities, teaching goals and philosophy, progress towards these goals, and supporting

data. Peter Seldin in *The Teaching Portfolio*[10] provides a detailed description and several examples of teaching portfolios. One word of caution is necessary; the goal, the plan, and the teaching portfolio are not the end product. They are only a means to ensure that we meet the goal we set for ourselves: that we stay close to our students throughout the tenure process.

5. Summary

Tenure track professors daily choose between time spent on teaching and research. Time is tight and it is easy to lose touch with our students. However, the opportunity to make a difference in the lives of our students is why many of us have chosen to become engineering educators. If we lose touch with our students, neither they nor we will be satisfied with the result. Three suggestions on how to maintain teaching on an equal standing with research have been discussed. These are: 1) including undergraduates more fully in our academic lives, 2) giving more responsibility for learning to the student, and 3) setting measurable teaching goals, establishing plans to meet these goals, and reviewing progress towards these goals. This does not suggest that a professor can be fully involved with each of their students. Even if this is desirable, time will not permit this luxury. Teaching is a shared responsibility with other faculty members and the students. Each student chooses the path for her/his education. Some students will choose to complete quickly, others will choose to become involved in social activities to the exclusion of other activities. However, many given the opportunity to become more involved in their education will take this opportunity. It is the responsibility of the professor to provide these opportunities. This requires that we find paths that extend beyond "get tenure first! … and then think about teaching." This paper suggests a few of these paths.

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