

Turning the Tide on Nuclear Engineering Undergraduate Enrollment

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The steep drop in undergraduate enrollments in nuclear engineering since the early 1990s is a serious threat to nuclear engineering in the U.S. and to the leadership that the U.S. has shown in nuclear matters around the globe. Without a feedstock of fresh nuclear engineers into the national nuclear infrastructure, America is on a clear course of self-destruction of an extremely valuable capability.

As a consequence, substantial efforts have been expended to determine the causes for this precipitous drop (65% reduction in students between 1993 and 1998). Senator Pete Domenici (R-New Mexico) has sounded the alert from the U.S. Senate and Congressman Joe Knollenberg (R-Michigan) is sounding a similar alert in the U.S. House. A recent study by NEDHO (1) revealed that the gap between the number of jobs available and the qualified applicants is large and growing (projected to be about 3:1 in the next few years).

Given this backdrop, the recent rise in undergraduate nuclear engineering enrollment at Texas A&M University has been quite gratifying—our undergraduate enrollment having doubled from 1998 to 2000. Whereas this could be simply a spurious spike that cannot be sustained, we felt an obligation to share some of the efforts that have been employed to achieve this upward surge in the hopes that at least some of these techniques might be employed elsewhere. It is important that all strong nuclear engineering programs in the nation experience similar success if we are to produce the qualified manpower that our country needs.

Listed below are the 8 steps that we at Texas A&M have employed over the past two years.

- 1) **Building the Case:** In order for any product to sell, the basis for sale must be solid. With regard to careers in nuclear engineering, the case today is probably as strong (if not stronger) than it was in the heydays of the 1960s and 1970s. The fundamental reason for this is that the job market is growing and the student supply is low and dropping. Students should be asked when to buy stock—with the obvious answer “Buy when the price is low!” The recent NEDHO study (1) makes it crystal clear that there currently exists a mismatch between demand and supply, and this gap is increasing rather dramatically (up to about a 3:1 ratio within the next few years). Further, nuclear power in the United States is now very stable. The plants currently on line are highly valued on Wall Street and plant lifetime extension is likely to keep most of them on line so that

today's graduates can look forward to a full professional career at a single plant, should they choose to do so. But even beyond this, new life within the U.S. Department of Energy (such as the Generation IV efforts) provides students with at least some hope that new designs will receive serious attention. There are even "rumblings" of a new plant order within the U.S. in the relatively near future—something unthinkable even three years ago. The recent power shortages in the West are almost sure to spark renewed national discussion regarding the need for new plant construction of some type—and nuclear power provides a very attractive possibility.

And, of course, there are many careers outside of nuclear power for nuclear engineering graduates. Opportunities abound with nuclear medicine, agriculture, petroleum, general industry, law, and a whole host of fields. In fact, only about 1/3 of the nuclear engineering graduates at Texas A&M go into the traditional nuclear power field. This degree is a foundation for a rich host of opportunities in a wide variety of fields. Hence, the basic case for attracting good students into the profession is solid.

- 2) **Rallying Industry Support:** Armed with the clear mismatch between job opportunities and the number of students in the pipeline, our next step was to contact major potential employers of our students within the State of Texas and surrounding regions. Once they saw the problem, many of the top executives agreed to participate in the formation of an External Advisory Council to see how, collectively, we might be able to reverse the downward spiral of entering freshmen. In our case, we also asked several well-known top industry and academic leaders from around the nation to join the Council, and we were fortunate to obtain an affirmative response from all we invited.
- 3) **Developing "Headliner" Scholarships:** The first step of the Council was to help our department develop a "headliner" scholarship program, entitled the Stinson Scholars Program, named after the chair of our Advisory Council, Ron Stinson (an early alumni from our program and a Past President of the American Nuclear Society). These are \$10,000 scholarships, payable at \$2500 per year over 4 years for superior students who remain in excellent academic standing within the program. We requested industrial support for these scholarships and were fortunate to obtain 4-year commitments from several corporations. We issued 9 Stinson Scholarships to start the 1999 fall semester and were able to increase the total to 14 to start the 2000 fall semester. This has been so successful (in attracting both quantity and quality of students) that our faculty sponsored 2 of these Stinson Scholarships this year from personal funds!
- 4) **Promoting other Scholarships:** We, like several other programs, have been the fortunate recipient of the new DOE matching program, which has allowed us to both upgrade computer facilities and offer additional scholarships. Using the Stinson Scholarship program as our major advertising leader, we have been able to get students to apply for a variety of scholarships, including those offered by DOE, ANS, NANT, plus other departmental scholarships (some of which are endowed). The overall push for scholarships allowed our undergraduates to go from a total of 5 scholarships in 1998 to

33 in 1999 and 54 in 2000 (with respective yearly monetary totals going up from \$5,000 to \$52,500 to \$100,000 in these respective years).

- 5) **Publicizing Starting Salaries:** The College of Engineering at Texas A&M University is one of the largest in terms of enrollment (if not the largest) in the nation. It totals around 9500 students. The Department of Nuclear Engineering is the smallest department within the College (likely the case throughout the nation), yet our seniors received the highest starting salaries in the entire college in 1998—plus signing bonuses in many cases! This position was maintained in 2000. Hence, we are able to tell prospective students that we have excellent scholarships and that they will be very well rewarded when they finish the program. This is a powerful message!
- 6) **Recruiting New Students:** Armed with the above messages, our first direct recruiting step was to design and publish a new undergraduate recruiting brochure. This rather unorthodox brochure (clearly designed for the “now” generation!) contains the essence of the above messages, plus testimonials from some of our most successful graduates. Our first batch of brochures, along with a recruiting letter, went to some 200 high schools—those where some previous contact had been made. Buoyed by a highly successful “Women in Discovery” Program (2), which featured the legacy of Marie Curie, the list of schools currently being contacted has been extended to approximately 650. For those new high school students accepted into our program, faculty and students within our current program placed telephone calls. This was done in recognition that many of the best students are accepted into several programs, and we wanted to maximize the “catch” rate. In addition, a special letter was sent to these students by a CEO at a nearby nuclear utility—congratulating them on their choice of major and offering a summer job to all students in good standing at the conclusion of their *freshman* year! Some actual recruiting visits were made to high schools, but that has been minimal to date. We hope to substantially increase this in the near future. Teacher workshops continue to be very helpful, because once teachers are aware of the incredible opportunities in nuclear engineering, they are far more likely to pass that enthusiasm on to their students. Having conducted one successful workshop last year, we have already completed another one this year and hope to do several more. Our faculty members have also given several talks and workshops on campus for high school students visiting for other campus-wide events.
- 7) **Recruiting On-Campus Students:** Freshmen admitted to the College of Engineering at Texas A&M are required to declare a major upon arrival. However, the curricula for freshmen are essentially the same for all majors. The College has two “Open-House” nights each year (one each in the fall and spring semesters), in which students are required to attend two departmental presentations. They generally attend the presentation given by the department of their declared major, but they must attend one other session. We push hard for them to select the nuclear engineering presentation as their other choice, and we provide information condensed from the above material (items 1 through 5) by faculty and students. Our most persuasive speakers are our top students, who carry unbridled enthusiasm for our program.

- 8) **Emphasizing Retention:** Perhaps our best recruiting tool is the way we try to treat students once they are accepted into the program. For example, this year our student leaders went the “extra mile” by personally greeting all new students as they came for campus orientation. In addition to making them feel welcome, they invited them to a “get acquainted” party sponsored by the Department shortly after the opening of classes. We were especially fortunate this year to have ANS President Jim Lake in town in early September, so we built the party around him. Approximately 100 students came to the barbecue. This occasion provided a particularly good opportunity for recognizing the scholarship winners. We also inaugurated a mentoring group program, whereby groups are formed which consist of new students mixing with upperclassmen and graduate students (a range from freshmen to Ph.D. students)—along with one or two faculty members—for free pizza approximately every two to three weeks. There is no set agenda, but the personal interactions and networking that naturally transpire seem to be very meaningful to students at all stages of their careers. We currently have six such mentor groups in the department and each group has about 8 to 14 members. The opportunity for dialog and to get to know one another, and the faculty, has been very positively received by the students. Also, we strongly support student professional groups. Students participating in student activities are rewarded by department sponsorship of travel to national and international professional society meetings. For example, 26 students within the department were sent to France in the fall of 1999 to a conference in Paris sponsored by the French Nuclear Student Section. An average of about two dozen students are sent to national ANS and HPS meetings each year. Also, 6 students were sent to Russia as part of a NATO conference this past summer. Other students have been able to attend meetings in Japan and Belgium. This type of support is highly appreciated by the students, and they readily share such experiences with students in other departments. We believe this type of attention and support is responsible for both a highly motivated student population and a major reason we attract several students each year who decide to transfer in from other departments.

Whereas it is difficult to ascertain which of the above approaches is most influential in our recruiting process, we tend to believe that the hot job market (high paying jobs) and large scholarships are the primary ingredients for the rapid increase in undergraduate enrollment. As shown in figure 1, our undergraduate enrollment plummeted to a low of 55 in 1998 (mirroring the national trends) but has subsequently climbed to 109 in the fall of 2000 (a doubling in two years). We fully recognize that this trend may not be sustainable. It is still a very difficult job to attract good students into a profession that has received such bad press within the past decade. But we are gratified by the rebound recently experienced and hope that at least some of the efforts we have employed might be equally successful elsewhere.

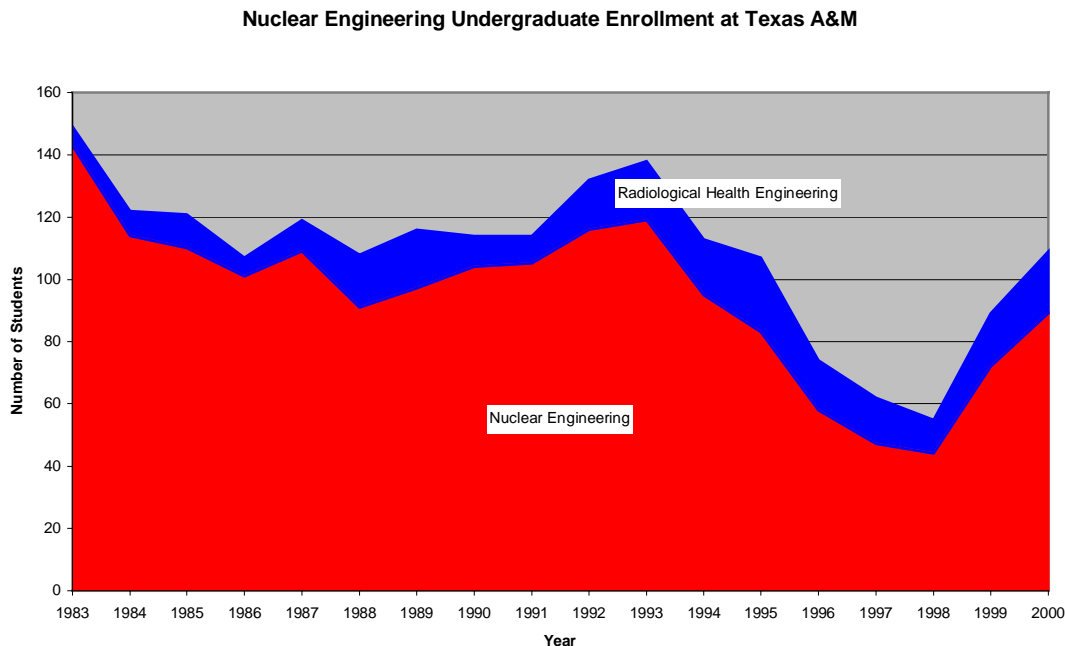


Figure 1. Nuclear Engineering Undergraduate Enrollment at Texas A&M University

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