2002 Distinguished Teacher of the Year

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First of all, I'd like to extend my thanks to the student committees who were involved in the teacher of the year selection process. You would all be extremely impressed at the level of dedication they exhibited in evaluating candidates. In choosing a winner, you can be certain that it was an extremely difficult, tortuous task, and I am deeply honored having been chosen. At this time, I would like to mention and honor the other finalists this year: Dennis Palkon, Business; Walid Phares, Arts and Letters; David King, Architecture, Urban and Public Affairs; Teris Touhy, Nursing; Daniel Raviv, Engineering; Mark Tunick, Honors; Michele Acker-Hocevar, Education; and Andrew Kulawik, Arts and Letters. All of us most certainly have our own individual teaching techniques and philosophies, but we all possess attributes that students value in their teachers. Perhaps the truly deserving teacher of the year award winner would be some combination of all of us.

I'd like to thank my family for being very supportive, understanding and a wonderful diversion from work. There are a number of colleagues in the College of Science that I should thank, most notably Fernando Medina for his support, John Wiesenfeld for his realistic point of view and words of encouragement, and many other colleagues with whom I have discussed various aspects of physics and teaching. I have learned so much from so many people through the years. And, importantly, Debra Kain deserves a great deal of thanks for her behind-the-scenes work in the teacher of the year selection process.

During graduate school, my father heard that I was taking a machine-shop course to learn how to use lathes and milling machines. This is standard for physics graduate students. Upon hearing this, he said, "Well, if things don't work out in physics, at least you will be able to find a job as a machinist." Physics, some of you may wonder, what is that "really"? This still remains a somewhat difficult question to answer. Physics is a broad and ever-changing field of study that deals with the general principles describing how the physical universe operates. It is not simply a collection of facts; it is also the process of how we arrive at these principles. Physics is, without a doubt, an experimental science. Ideas, theories, calculations, postulations must ultimately be tested and stand up to rigorous experiments. It is probably this aspect that attracts me most to physics – its experimental nature. Conceptualizing, designing, building and executing experiments is great fun. One gets a fantastic feeling in discovering a small tidbit of information that nobody else in the world has knowledge of. Let me share this example with you. Back in 1991, working with my master's student in the lab in Munich, I did a simple what we call "back of the envelope" calculation regarding a quantity we were trying to determine in a high pressure experiment dealing with superconductivity. My calculation revealed something that had not yet been observed. Sure enough, a few hours later our measurement proved the calculation correct. We built on this, with roughly two-years of full-time work, publishing a short four- page paper that is most certainly my best-known work. We were able to establish a solid foundation in this particular sub-field in superconductivity research, which others have since built upon. I feel fortunate to have had similar experiences a number of times, and it is truly exciting to be a participant in this process of discovery and the quest for knowledge. Life as a scientist is like a walk on the beach, turning over stones as you go.

As you might realize, the opportunity to conduct research is an important component of my professional life. For me, the university is a place where both students and faculty should be forging ahead to their own individual "forefronts of knowledge" – the students, in early years, learning the basics, and the faculty participating in their own academic or artistic development at the forefront of their fields of activity. I view this as a fantastic opportunity for both parties, a true gift that should not be taken for granted or abused. In the last few years, the graduate students in my laboratory have been working on a range of problems. We guide each other in this research, learning and growing together. One student is nearly finished with a master's thesis describing a highly sensitive experimental device we developed and constructed here, the only one of its kind in the USA. Can first-rate research be done at FAU? The answer is yes!

In the classroom, I follow a few simple themes. As an experimental science, physics must be represented in that fashion. This means demonstrations, connections to the real world and a constant reminder that it is an extremely important subject that touches our daily lives. If anyone in the audience has ever seen an MRI instrument used for medical imaging, the heart of this device is a superconducting coil. Without it, and the discoveries made in superconductivity in the 1960s, that instrument would not exist. Power generation – move a magnet through a coil and a current flows in that coil, it is that easy. Want to talk about hurricanes and why roofs can lift off of homes? Gently blow over the top of a piece of paper and watch it rise. Yes, physics has lots of equations….but it is and will remain an experimental or observational science, and this should be continually reinforced in the classroom.

Teachers in the sciences play a very important role in the development of students' analytical skills. These students will one day be designing bridges and buildings, estimating radiation doses for cancer treatment, developing drugs, advancing technology and participating in a host of other important positions within society. Science and mathematics courses are the only avenue we have to influence the students in this regard, and it is a mistake to dilute these courses through de-emphasis of the analytical component. We need to train and challenge the students in solving analytical problems, being careful to provide them with the necessary tools for success through examples. Ultimately, the students must develop these analytical skills on their own as well as a level of confidence that allows them to recognize when they have correctly carried out a specific calculation or task. We as teachers must nudge, push and sometimes shove the students in developing these skills. We cannot simply answer their questions; rather, we must interact with them in a didactic fashion, encouraging them to ask and answer questions on their own. It is a fact that the best science begins with the best questions.

I believe strongly in maintaining a high academic level in the classroom with regard to the material presented, quantity of material, exams and finally the grading policy. It has been, and will remain, my policy to set reasonable, well-defined standards for students which assure that a passing grade signifies adequate knowledge for continued study in the sciences. I have had many first-rate students at FAU who would have excelled at any university in the USA. However, on the other end of the spectrum I have been shocked. In the last few years, only 60 percent of the students entering my first-semester introductory physics class actually earn a passing grade. Let me assure you that my standard is not exceedingly high; those who drop or fail do little work. Also, let me assure you that I have quantified this observation; after all, they are dealing with an experimental physicist! It is our duty to guarantee that our students possess the knowledge base and skills needed to succeed in future endeavors, and we need to encourage and sometimes force them to do the necessary work. If we don't, we have done a huge disservice to society. It is the low success rate in introductory science classes that troubles me the most about my job.

Although maintaining a high academic level is important, we also need to be realistic. It is obvious that we cannot compete with top-ranked universities in always attracting the best students. This means that sufficient personnel infrastructure must be in place to nurture the students we do attract and assist them to reach their highest potential. These students deserve our respect, dedication and attention. For example, better advising could do wonders in improving the success rate of our undergraduates. This needs to be done in an aggressive fashion so we catch problems early in a student's career. Actually, all faculty could become involved in this mentoring process, each accepting a handful of advisees. We also need to offer improved remedial help for our students. It is shocking to me that FAU does not have a math and science skills center where undergraduates can be tutored by their peers. This would be a win-win situation in which our best students sharpen their own skills while assisting weaker students. Don't you agree that undergraduates are more likely to seek and accept help from peers instead of from graduate students and faculty? Can this work? You bet it can. I was employed at a similar center as an undergrad at Stockton State College. I mention these suggestions because of our dismal retention rate (near 40 percent). Improving student success and retention is at the heart of developing a strong reputation as well as a growing group of contributing alumni. This is a long, hard task that must begin immediately if FAU is to move into the next phase of its development.

Yes, FAU has grown dramatically in the last years. Now is the time to place more focus on the quality of educational and research programs and retention.