

1980 Distinguished Teacher of the Year

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Like many individuals in other walks of life, I find that I arrived in my present occupation, that of chemistry professor, without any clear predetermination of this as a professional goal. However, once I found out who chemistry professors were and what they did, I knew right away that I liked it.

What chemistry professors do is chemistry; that is, they do research in and teach chemistry. I am often asked a question about this that I find difficult to answer. The question is "Which do you like better, teaching or research?" The difficulty is not that I am incapable of choosing between teaching and research, but that I do not regard the two as separate endeavors. It is an unfortunate consequence, therefore, that teaching and research are considered more and more as separate activities by a large segment of the population, and, more importantly, by the academic community itself. In demonstration of this fact, guidelines exist in many universities, including those in Florida, which require that faculty account for and be evaluated on their separate contributions in teaching and research. Such classifications are unfortunate; they create an artificial division between inherently continuous scholarly activities and have a harmful impact on the goals of higher education.

Conventional definitions regard teaching as the transmittal of knowledge and skills and research as the discovery of new knowledge. In my experience these are closely related activities. An example comes from a course in introductory chemistry that I have taught to students in the Faculty Scholars Program at FAU. An important topic in this course is molecular structure. In attempting to present this material in an understandable manner to beginning students, I found that I was forced to understand more clearly the fundamental concepts of the subject. This insight helped to shape my own research program, which has as one objective the search for new relationships between molecular structure and chemical reactivity. This happy marriage was not consciously planned, but evolved naturally from simultaneous involvement in the two activities of teaching and research.

Research also contributes positive feedback to teaching. Research provides faculty with a perspective of fundamental relationships and new developments in a field that can be returned directly to students. Some of the most animated conversations I have held at FAU have been informal discussions with students about the general objectives and

methods of my research program. Students are hungry for this information; they want to know what is new in the world. Research also provides students with first-hand experience of what it is that faculty members do as professionals on a day-to-day basis. This experience is very different from that in formal classroom education. Finally, research itself is an effective teaching device. In accomplishing a research objective a student not only learns new knowledge and skills, but also develops initiative, independence and critical judgment. These are factors which should be foremost in a higher education experience.

The present status of higher education presents a scene that is very different than this unified picture. Today an enormous dichotomy exists between the level of accomplishment in research programs and the level of basic instruction in most academic institutions. Research has proceeded rapidly along paths of uninhibited inquiry, as it properly should, and has increased immeasurably the sophistication and wonderment of our lives. Recent advances in planetary exploration, computers, communication technology and genetic engineering are examples that dramatically underscore this progress. Teaching, however, has changed very little in recent decades, during which much of this progress has occurred. Instruction has been limited too much to simply the transmission of factual information. As more knowledge filters down from research, courses and course requirements expand to transmit the additional information to students. The net result is an educational process that is not very well balanced. What is lacking is a connection between fundamental concepts at the base of each subject and on-going research in that field. I believe students perceive that such an ingredient is missing. Indeed, this shortcoming may underlie many of the disturbing symptoms evident in higher education today, namely (1) a growing disinterest on the part of capable students in traditional academic curricula, (2) a general increase in technological illiteracy and a decline in basic educational skills of students, (3) a shortage of students and faculty in key areas of national interest and (4) a widening gap between the capabilities of universities and many sectors of private industry. In short, we may be depriving our students by failing to provide them with sufficiently challenging academic programs.

The principal challenge facing universities in the coming decade will be to educate students at a level commensurate with recent scientific and technological advances in society. Universities need to upgrade their programs and adopt new methods in order to achieve this goal. An important part of this objective can be accomplished by a greater unification of teaching and research. For example, it would be desirable to condense the fundamental material in all subject areas into a small number of course requirements to allow undergraduates the opportunity of extensive research experience. This research, of course, may not be as sophisticated as that conducted by

advanced graduate students, and the expectations of students and faculty should be adjusted accordingly. However, the experience can give students a more meaningful appreciation of the subject matter. Research is the thread that leads from established concepts at the foundation of each subject to new understanding in that area. Research teaches students skills and judgment that cannot come from classroom instruction alone. Research gives students the opportunity to experience a subject first-hand and determine if they actually enjoy it. Discovery of this enjoyment provides the motivation that leads to continued growth and understanding for the rest of their lives. This enjoyment is perhaps the most important missing ingredient in our educational process today. For me, this enjoyment has come from the mutual rewards of research and teaching. It is the essence that has made it fun to be a chemistry professor.

Thank you very much.