

THE TEACHING EXCHANGE

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MY TEACHING PHILOSOPHY

Robert Pelcovits
Physics

[Ed. note: Prof. Pelcovits was selected as a 2008 Royce Family Professor of Teaching Excellence. His teaching philosophy statement exemplifies how faculty can effectively document the significance of their teaching practice.]

I have taught a wide variety of courses in the Physics Department since joining the Brown faculty in 1979. These courses have ranged from introductory ones aimed at premeds or physics concentrators to the most advanced graduate courses that we offer. Each class has its own particular challenges, but in all of these courses I face the challenge of dealing with students with different learning styles, background knowledge and mathematical ability. Foremost in my mind as I teach a class at any level is how to engage a diverse group of students and help them learn as much of the subject material as possible.

Physics is a beautiful, intellectually rich subject. While I am a theoretical physicist and teach theoretical material, the laws of physics are ultimately based on experiment so I must in all cases emphasize the experimental connection to the students. I usually do this by making ample use of lecture demonstrations. We are fortunate to have a superb set of demonstrations and an exceptional staff member, Jerry Zani, who sets up the demonstrations for professors and is always eager to explore new ideas. Not only do demonstrations break the monotony of a lecture class, they emphasize the experimental basis of physics. It is important that students make the connection between the theoretical physics on the blackboard (which can get very abstract and complicated) and the straightforward physical phenomena observed in a demonstration. In introductory classes I emphasize that all of us are physicists by experience; we have been experiencing and manipulating the physical world since infancy, developing our physical intuition. So I often ask the class to predict what they will observe in a demonstration before it is carried out, to encourage them to appreciate how much physics they innately know. Once the demonstration is complete, I then show how we encode the result mathematically. By linking a concrete observation to a mathematical statement I try to demystify the mathematics of physics and show students how math is simply a very convenient and

precise way of summarizing observable phenomena. While this approach is particularly useful in introductory classes, even more advanced students benefit as well.

Physics can and should be appreciated on multiple levels. Ideally, every student should master physics by understanding the implications of a demonstration or experiment, thinking intuitively about physical phenomena, and encoding and manipulating these phenomena using mathematics. In every course I teach, at all levels, I encourage students to think in these different ways and master these approaches to the best of their ability. Even in the most advanced graduate courses where we get very immersed in complex mathematics, I encourage students to think intuitively as well as mathematically, and to get beyond using the mathematics as a substitute for a deeper understanding of the physics.

Over the past ten years I have tried to make my classes more interactive. I have always encouraged questions from my classes and have never demeaned a student even if they've asked a silly or trivial question. I would rather patiently answer such questions rather than discourage timid or self-doubting students who might ask great questions. As a way of learning new techniques to make my classes more interactive I arranged an Individual Teaching Consultation (ITC) with the Sheridan Center about ten years ago. Becky More and Peter Heywood visited my Physics 4 class and provided me with many useful suggestions on how to encourage classroom discussion and go beyond the traditional physics model of the professor lecturing for the entire hour with barely a word uttered by the students. What I learned from Becky and Peter has profoundly influenced my teaching style. I was particularly pleased to read the Critical Review of the sophomore level course I taught last fall, PHYS 0720, "Methods of Mathematical Physics", where a student was quoted as saying that I was so responsive in class that "lectures were almost a conversation." I believe that some of this success is due to my encouraging the class to anticipate the next step in a derivation or development of a theory. While helpful hints are often necessary, in many instances a student can offer an intelligent guess as to what should come next. Not only does this lead to more classroom discussion, it also further demystifies the subject material and leads us away from the model of a professor presenting the material while the students transcribe it.

Even after nearly thirty years at Brown, teaching remains as fresh and exciting for me as it did when I joined the faculty. I feel blessed that I find physics as intellectually stimulating and exciting as I did when I fell in love with the subject at age 12, and I am very fortunate to be at an institution like Brown where students share my intellectual excitement. While I have taught many different courses over the past thirty years, there are many more in our curriculum that I am eager to teach. My own appreciation for physics and mastery of the subject have grown tremendously over the years as I have taught very bright, inquisitive critical thinkers like our students.