**Statement of Teaching Philosophy**

Of all careers, teaching has the potential to be the most rewarding and offer the most opportunities to positively influence the lives of others. In addition, being an effective teacher is one of the most challenging tasks one can undertake. It is in identifying these challenges that I find my goals and philosophy of teaching.

The primary goal of all science education should be to turn students into problem solvers. Teaching another person problem solving skills is difficult, however, because it is not the sort of knowledge that is transferred through telling but is learned though experience. However, there are some strategies that I intend to use to assist my students in becoming problem solvers. I intend to have students practice different types of problems in class individually or in small groups where I can act as facilitator. It is also important for the instructor to demonstrate how to work through difficult problems in class. Textbooks are especially guilty of demonstrating concepts and techniques by solving the simplest, almost trivial, example problems leaving the student to struggle with approaching a more complex problem. In class I will try to find more challenging examples and demonstrate the steps involved in tackling them. I also think a major obstacle to solving physics problems is that students do not have a mastery of the mathematical tools necessary to solve the problems. While it is reasonable to expect that students in introductory courses know algebra and trigonometry and that upperclassmen know calculus, it is important that a lack of knowledge of other tools not frustrate them in their attempts to solve problems. As an undergraduate, I learned statistics, Fourier analysis and much of linear algebra in my physics courses, despite being a math major. It is important in the course of demonstrating problems to name the mathematical tools as they are used and to provide the students with references and perhaps handouts so that gaps in math knowledge will not become a roadblock. Finally, assessment can be used to emphasize the importance of problem solving by challenging the students with novel problems

A second challenge, is to teach in such a way that the material presented in class is carried beyond the class by the student where it affects his or her views about how the world works. Students come to class with powerful misconceptions and it is a great challenge to help them to grasp the fundamental ideas and incorporate them into the approach they take in understanding the world around them. For example, at the beginning of introductory physics most students really do not understand or believe Newton's first law. One way to help students link concepts with the real world is to link problems to the real world. As much as possible, problems seen in the class and in homework should involve actual problems or situations that the students can visualize. If this is not possible (say, with solving the particle in a quantum potential well problem), students should be told how the problem relates to a real problem (the quantum well problem is practice for the electron in an atom problem). Hopefully, this way students will be able to see how basic ideas relate to situations outside the textbook and can re-train their intuitions.

A third challenge is associated with my belief that the classroom can be an important venue for outreach. Many people have great misconceptions about the current state of physics and astronomy. I have encountered people who wondered why I was doing research in physics since they thought that the physical sciences were “dead” and the last important discoveries were made in the 1920s and 30s. On the contrary, there are many very exiting discoveries being made and students should not be left out and led to believe that physics is all about spherical cows, massless, frictionless pulleys and blocks sliding down inclined planes.  I plan on including vignettes on current research and discoveries into classes and relating topics and problems studied in class to current problems whenever possible.  This will challenge me to keep abreast of current research, but it may aid students in becoming more excited about the material, to see its relevance and convince them that physics is a thriving, vibrant field.

Finally, there is the challenge of involving students in research.  I view research as being an essential part of education and education as being an essential part of research. Research and discovery for its own sake is good but research done for its own sake and the sake of education is even better.  I was very fortunate in my own experience as an undergraduate to have been able to conduct research with someone who was a very strong mentor.  As a result, I view learning physics as an apprenticeship where research techniques and scholarship are passed from mentor to student.  I see teaching at a smaller university or college with correspondingly smaller classes to be a distinct advantage in this area, allowing far more personal interaction.  It is my aspiration to be as approachable and as influential in the lives of my students as my undergraduate professors were to me.  My goal of teaching at an undergraduate institution and doing research with undergraduates influenced my decision to join the  LIGO collaboration as a graduate student.  One thing that attracted me to the project was that it involves a new type of experiment with a new type of instrument.  I noted that many essential systems, such as the program controlling the actuators that compensate for tidal forces on the instruments, involved major undergraduate contributions.  There is still plenty of work to be done, work that is accessible to undergraduates.

As much as I hope to meet the challenges posed by teaching, I hope to be taught as well.  I believe that to be an educator is to be a lifelong learner.  My goal is to come away from each class having learned as much as the students.