

Jeffrey Allen Phillips

Department of Physics
Loyola Marymount University
Los Angeles, CA 90045
(310) 338- 7811
phillips@lmu.edu

TEACHING PHILOSOPHY

As I told some my introductory physics students at the beginning of this year, the best compliment I think anybody can pay a student is to call them a scholar. Students should get more out of college than simply a certificate and a loan to repay; they should gain the problem solving skills of a researcher, improve their writing and communication skills that will be used throughout life, and, perhaps most importantly, recapture the curiosity of their youth. There is no doubt about it, I believe that high expectations bring high achievement. It is not always easy for students to grow into scholars, but through the selection of material, techniques used in the classroom, and the general classroom atmosphere, I hope to make their journey a fulfilling one.

One of the most important skills that we practice in physics courses is problem solving, which I define as more than just the ability to work out traditional end-of-chapter exercises. Problem solving includes asking the right questions, reducing complicated situations to simpler ones and researching any necessary information. For example, in honor of the annual Little 5 bike race held at DePauw, introductory physics students designed their own experiments to investigate the physics of a bicycle. They had to think of a question to investigate as well as design experiments that they could perform. The end result is that the students learned how to ask and answer questions and became better scholars. Too often problem solving is seen as only being relevant to physicists when, in fact, it is a skill all of us need throughout our lives.

The first step in having students learn about science and the process of science is encouraging them to enroll in the course. One of the questions I have been asking myself lately is- Is it possible to offer a lower level course that requires no prerequisites and would appeal to students in other majors? The idea is to keep the focus narrower than a typical survey course, tapping into the students' existing curiosity and eliminating material that isn't of interest. After all, not all students want to understand Kepler's laws. For example, an art major might enjoy learning about the physics of light, a computer science major could study the physics of semiconductors & circuits, and a music major may want to learn more about how instruments produce sound and enroll in a physics of music course. All of these themes would still allow students plenty of exposure to key concepts in physics. In addition to covering particular material, these courses would differ from others in their assignments and projects. For example, in my recent freshmen seminar we wrote essays, constructed visual art projects, and participated in debates, all techniques borrowed from other disciplines. In this way, students are able to become well-rounded scholars acquiring numerous skills, in addition to problem solving.

A similar philosophy of having interesting and relevant content can be applied to the introductory course. One goal I have for the course is to eliminate all problems that talk about "an object". Last spring I saw just how much of a difference having a story could make. Instead of talking about the motion of "an object", we talked about an electron in a TV. Students were truly excited by the problem, I had several talking to me after class about how a TV functions. The goal here isn't simply to make a "fun" course for the sake of keeping students happy, rather

by having a fun and interesting class, students are more likely to learn. Students who are motivated are much more likely to learn how to solve problems and understand concepts as well as allow their curiosity to develop.

Students need more than just the right course content for an enjoyable and educational experience. What we do in the classroom is also important. I have always tried to demonstrate my enthusiasm for physics with a smile, excited voice and appropriate gestures, but lately I have tried to go beyond this. Granted I am no actor, but it only takes a few small changes to relax the students and begin to develop a relationship with them. After the first time I met my “Science of Art” students, several exclaimed “you’re not what we expected from a physics professor!” I hadn’t done much beyond wearing a colorful shirt and making a few (almost funny) jokes, but I had managed to make them smile. Asking a student to become a scholar is no simple task, and I know it takes hard work on the part of the student as well as me. Without some fun (my colorful shirts, or studying color mixing with finger-paints), students can get very frustrated, making the journey to becoming a scholar a more difficult one.

Before I am accused of playing a “sage on a stage”, I should describe a little more of what often happens in our classroom. Students are asked to share in the responsibilities- they do everything from provide explanations to facilitate discussions. In my seminar class, the students even helped to design the course syllabus. We spent the first day of class, not going over a syllabus imposed upon the students, but rather the students selected the topics and many of the assignments for the semester. This and other such activities have helped to provide the students with a sense of ownership about the course. I am happy to turn over control of a class to the students, and we become a team working through the course together. By having good relationships with the students, I feel we can be more open with each other, providing each other with feedback. I continually ask students to tell me how a course can be improved. This dialogue not only helps to improve the course, it also serves a model for the students as they learn to become more reflective.

We often use *Peer Instruction*-like and *Workshop Physics*-like techniques, allowing students to learn from each other. Typically, classes resemble conversations, not lectures, where students and I engage in a back and forth exchange. They provide both the questions and answers and I help to fill any gaps left by the students, but I do my best to back away from being labeled the sole expert in the class, all of the students have information and questions worth sharing. In addition to improving the students’ dispositions, the other great benefit of active learning is that students typically learn the material and techniques much better. The more that students are able to do in class (solve problems, ask questions, perform experiments), the better. In our class, students have even role-played photons in time dilation experiments. Within such a cooperative environment, students are able to also work on their interpersonal and communication skills.

Through what my students and I do in the classroom I hope that students will learn many skills, ones that may have a lasting impact on them. Not only will they learn about the wonders of the universe, but they will also learn how to think, communicate, and ask questions. This multilayered learning is definitely one that is best achieved in a relaxed environment. While the topic of study may be physics, the students are learning more about themselves, refining their critical thinking skills, and practicing their communication skills- in short they’re becoming scholars.