A statement of teaching philosophy

By

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Why do I want to teach? First and foremost, I think physics is really interesting. I love it; it challenges, stimulates and inspires me. I want to share this passion with others, to help guide the explorations of those who share my passion and to offer a compelling glimpse at new perspectives for those who don't. I am slightly awestruck at the notion of being able to help a student "over to the dark side", to aid in the transformation from interested observer to active explorer. It would be even more compelling to transform the outlook of someone who never thought themselves interested in science. The only thing that would be more exciting to me than teaching a course in elementary particle physics to physics majors, would be teaching a course in modern physics to a room full of humanities majors.

Secondly, I firmly believe that physics and science in general are areas of required understanding for those who wish to participate in an informed way in the government of today's society. Without basic scientific literacy, a person may find himself unable to make sound judgments on critical issues. Those who lack these skills will inevitably rely on someone else's opinions and judgments, which ultimately may not reflect their own best interests. I want people to believe that they are fully capable of understanding the issues the modern technological world faces, and if they don't understand, to ask again until they receive an answer that they can understand.

Finally, I am personally grateful for the framework that academia has given me in which to explore and satisfy my intellectual curiosities. I want to give something back to that process, to ensure that future generations have the opportunity to find their own way to explore their universe and themselves.

The teaching of a course should consist of more than the simple transmittal of facts and figures. A successful course will build on the fundamental academic skills of the student, skills that are useful not only in physics, but throughout academia. The course material should engage the student's skills in critical thinking and problem solving. The student must not only be given a set of tools, but taught how to use them as well. In the big picture, any given course must not only transmit the ideas and the skills related to that specialty, but it must play its part in orienting the student to the field, to get them to start thinking like a scientist.

This does not mean that the obvious should be neglected. The successful delivery of the fundamental course content is critical. For a physics course, this primarily means the key physical concepts, and the equations that derive from them. Solving classes of problems related to the application of the core concepts and equations is also of significant importance. One should not neglect the historical and developmental aspects. For example, students should learn not just the names and the dates associated with key breakthroughs, but also develop an understanding of the necessary initial scientific, social, and historical conditions required before such discoveries could be made.

The means by which these objectives may be achieved are varied. The primary component is the lecture. In the lecture, concepts should be discussed thoroughly, and principles derived in a careful and clear manner. Time should be taken in the lecture to elucidate
key concepts with examples and sample problems. The lecture should not be a unidirectional flow; there must be discussion and interaction with the students, drawn out by open-ended questions if need be. While important at all levels, it is especially so in upper level courses, where the concepts become more subtle and difficult. If conditions permit, and the class is small enough, this discourse should take the form of a conference rather than a formal lecture.

Another key component is homework. This is the primary opportunity for the student to put what she has just learned to use, and to test her immediate comprehension of the material. Assignments should be given after every lecture, and focus primarily on the material covered in that lecture or in the most recent lectures as is appropriate. They should be returned at the next lecture, and graded with expediency in order to provide timely feedback to the students and to the teacher. Problem sets should be challenging, but not onerous.

Although homework is meant in part to measure comprehension, it is also an important arena for the learning process. Homework assignments can and should be collaborative in nature, encouraging members of the class to work together towards a common goal. By working with their peers, students benefit from seeing the material through a perspective other than their own. They also learn something about the collaborative nature of science. Scientists don’t work together just because a project might be too big for one person; there is fundamental value in seeing from another’s point of view.

Office hours offer yet another means of conveying the course content. This is of primary use to students who either feel or have proof that they are not quite "getting it." I personally strongly believe in the use of extended office hours, as these give me the opportunity to interact in a more one-on-one setting with the student, and would rather have an open door policy than set visitations. Review materials and additional sample problems are key elements of the successful office visit. Information from interactions in the lectures and conferences with students, as well as from the homework, is critical to making necessary adjustments to the course as the term develops.

Finally, depending on the course content, laboratories are useful venues for offering an additional perspective on the material. Demonstrable examples of the material covered in class should be sought out. In addition to relating the concepts and equations to real life phenomena, the lab experience/demonstration can add the "gee whiz" component which might be missing from a chalkboard or textbook. This is especially true (and more easily applicable in general) for introductory level courses.

If I have followed my game plan, and delivered the course content in the ways described above, I still need to know how I’m doing, and more importantly, how the students are doing. The first evaluation possible is from the immediate feedback from the lecture. Are the students "getting" what I’m talking about? If eyes are glazed over, does this mean I’ve lost people or that they are bored? Catching these things early is key so they can be fixed at the level of "today's lecture." It’s better to repeat a derivation or do another sample problem then to go back and cover the material again next time.
Homework assignments provide a slightly less immediate form of feedback. This is perhaps the best tool available, allowing for frequent checks of actual comprehension of core material and the development of problem solving skills. As mentioned above, this is at once both a forum for learning and for evaluation. Ideally, homework should count for a large fraction of the total grade or evaluation in the course.

The final tool for evaluation is the examination. I believe that examinations should test to the student’s overall understanding of the course’s core content and the student’s problem solving ability. Tests should consist not only of the familiar, but should have something new which requires the student to put her existing tools to use in a new way. Examinations should be "open book" to avoid any hint that the focus is on rote memorization. Tests should be of long duration; problems should be difficult and involved to test comprehension of multiple subjects and problem solving skills. In courses with significant laboratory content, the practical exam is an excellent way to test "hands-on" type skills.

In each of the experiences I’ve had teaching, I have learned first hand that I must modify my style/course to fit the needs of my students. I am excited at the prospect of learning how to continue engaging students, and building mutual enthusiasm by researching, studying, arguing and collaborating with them. I also hope to learn other pedagogical skills from my colleagues.