Statement of Teaching Philosophy

Zhenzhong Shi

Overview

I have been fortunate to have encountered many great teachers, who have shaped my view of teaching, and I think of it not only as a fundamental ingredient in an academic career but also my utter responsibility as a physicist. It is unfortunate that physics is often perceived as a subject that is boring and daunting by college students and by the public at large. I think, however, with the strong intention and right approach, I can help students appreciate the beauty of physics, and more importantly, help them develop critical thinking and problem-solving skills.

Teaching experience

I have taught college physics labs as a teaching assistant at different levels for four years, from Fall 2008 to Spring 2012, including summer semesters, when I was a graduate student at University at Buffalo (UB), SUNY. For each semester, I taught two classes, each of which consists of 27 students. My duties include: (1) a 20-mins PowerPoint-based lecture which covers the physics background; (2) a hands-on demonstration of the experiment; (3) supervising students performing experiments; (4) holding office hours twice a week; (5) grading weekly lab reports; and (6) proctoring and grading final exams for both the labs and corresponding lecture courses. In Spring 2012, I was appointed as the assistant to the director of undergraduate physics lab (Mr. Scott E. Whitmire). During that semester, my teaching load was reduced by half, and I took on the additional responsibility to (1) co-supervise all the undergraduate introductory labs with Scott and (2) help him develop and refine the curriculum of these labs.

I am grateful for having the experience teaching students who came from a wide variety of background and pursued different majors. UB enrolls a diversified student body with varying degrees of academic preparation. This had presented one of the major challenges I faced while teaching. It became clear to me that it is crucially important to design the class so that it is not just accessible to the elite students, but also understandable to the majority of the class. The majors of the students I had taught ranged from physics, to engineering, to pre-med, to business, to art. It was an interesting and rewarding journey to learn physics together with these students, who often approached physics problems from unique perspectives that do not naturally occur to a trained physicist's mind. I have since realized the importance of thinking as students, and not just as a teacher, in everything that I teach.

Through daily communications, feedbacks from lab reports and tests, as well as semester-end evaluations, I have found that the labs are often the critical component that helps students develop much better understanding of the materials that they had learnt from lectures. These experiences have partly shaped my teaching philosophy, as I will discuss in detail below.

Teaching philosophy

I believe it is critical to keep students actively engaged in the class. To do that, my goal is to create an interactive classroom environment in which I would constantly make adjustments based on students' feedback. Students are also encouraged to form small groups in which they could discuss conceptual questions with their peers.

Helping students develop an interest in physics is another important ingredient in successful teaching. Sometimes this could be difficult because many physics concepts are somewhat abstract and hard to visualize. Therefore, a teacher's duty is not only to guide students through equations, but also help them visualize the underlying physics principles, connect the dots to obtain a coherent understanding, and finally gain interest in physics.

Physics education is also about helping students develop critical thinking and problem-solving skills, through a deep conceptual understanding of the subject. I will design the curriculum having this in mind. In homework and exams, I will put more weight on demonstration of conceptual clarity rather than blindly solving problems based on recipe solutions. Students will be encouraged to find multiple solutions to a problem and earn bonus points.

I will also expand the physics teaching beyond classrooms by involving students in an active research program. At Duke, I have supervised undergraduate and high school student interns working in the lab, where they are exposed to the frontier of condensed matter physics and cutting-edge experimental techniques. These students actively participated in sample growth and characterization. Some of them had the chance to attend experiments in national labs. I intend to borrow this successful model, and I believe students could be benefitted greatly from an early exposure to formal training of scientific research.

Teaching interests

I am comfortable in teaching introductory physics courses for different majors, as well as condensed matter physics for senior undergraduate and graduate students. I am also very interested in developing and teaching more specialized courses on topics that are close to my research interests, which includes superconductivity and magnetism. For a superconductivity course, I will start from basic topics that are well developed in conventional superconductors, and then touch upon more advanced topics on unconventional superconductors. Similar method applies to a course on magnetism, in which I will cover materials from conventional magnetism to unconventional frustrated magnetism.

Finally, I think physics education should extend beyond the university, and I am very interested in outreach opportunities that bring physics to the general public. After all, scientific advancement thrives on the support of the entire society, and knowledge of physics should be shared with a broad audience.

Advising experience

Over the years, I have worked with many graduate and undergraduate students, as postdoc at Duke University and National High Magnetic Field Laboratory (NHMFL), and as senior graduate student at University at Buffalo (UB). At Duke, I have had the pleasure working with two graduate students (William Steinhardt and Brodie Popovic) and several undergraduate students (J. Park, W. Smith, Y. Zhang). At NHMFL, I worked with three graduate students (P. Baity, L. Stanley, and B. K. Pokharel). At UB, I worked with two graduate students (S. Singh and A. Alsaqqa) and three undergraduate students (C. Kilcoyne, C. Kwan, and C. Gorman). It has been a great experience teaching them physics and experimental methods.

At Duke, I have also organized a weekly journal club and gave mini workshops to facilitate group learning. It also turns out to be very efficient to bring new students up to speed.