Teaching statement

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From Spring 2006 to Spring 2009 I have taught an introductory physics course for science majors in the Physics Department of Princeton University. My duties were comparable to that of an assistant professor: I was in charge to teach theory and problems, identify potential Physics majors and students in difficulty and writing down and grading the final exam. In addition I was one of the members of a committee appointed by the chair of the department (Dan Marlow) to revise the curriculum of these courses. Overall student evaluations have been very positive (student reports are available upon request). Their performance was consistently above average with respect to other groups of the same course. Previously, as a graduate student, I held teaching assistant positions in Stony Brook (Classical Mechanics), U. of California in Santa Cruz (Introductory Physics Lab) and U. Autonoma de Madrid (Complex analysis). More recently I have taught a series of lectures on Mesoscopic physics for PhD students in the Theory of Condensed Matter group of Cambridge University. The attendance was above average. Since 2012 I have also supervised six Master thesis where teaching skills play an important role. Five out of six students obtained well above average First Class (A) grades.

Teaching Philosophy

My current teaching philosophy - a result of my personal experience and readings of science education literature (1,2) can be summarized as follows: Learning is an active process. In order to acquire knowledge, learners must reconstruct it in their minds. Consequently the role of a teacher is mainly to sustain the conditions under which learning takes place. In more practical terms, my pedagogical approach is based on the following general ideas:

- Keep students actively engaged in class. An active classroom environment is a prerequisite for knowledge construction.
- Develop and teach cognitive maps of the subject and general problem solving strategies. Students must always be aware how the goals of a particular week are related to the big picture of the course. Moreover they must learn to differentiate general strategies to solve problems with the particular techniques involved in each case.
- Foresee conceptual difficulties and deal explicitly with expected student misconceptions.
- Design exam problems that combine qualitative and quantitative analysis of physical phenomena. Avoid problems solved by 'equation hunting'.

Concerning the choice and organization of the material:

- Organize the material around a few fundamental ideas. The course must have unity.
- Stress common concepts and avoid cover subjects superficially. Deep rather than breadth.
- I would include some of the recent (first half of the twenty century at least) progress in the field adapted to the level of the course.
- I would focus on phenomena rather than abstractions.

My main teaching goal is to create an effective learning environment that will help student acquire both problem solving skills and a deep conceptual understanding of the subject. It is my intention to teach according to the state of the art results in physics education research and be especially aware of the student needs and misconceptions.

References:

(1) R.D. Knight, *Five Easy Lessons: Strategies for Succesful Physics Teaching*, Addison Wesley.
(2) J. Bransford (Editor), A. L. Brown, R. R. Cocking, *How People Learn: Brain, Mind, Experience, and School*, National Research Council (1999).