TEACHING STATEMENT

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Over my graduate student career, I have served as recitation instructor for several math and physics courses, ranging from sophomore-level wave & quantum mechanics, to introductory differential equations for engineering majors. I've also been a teaching assistant for upper-level and graduate-level courses in analysis (complex analysis, PDE, functional analysis) and quantum mechanics. As a postdoc, I'd be comfortable teaching the aforementioned courses, as well as a special topics class relating to my area of research, analysis and probability on fractals.

While the courses I've taught vary greatly in subject matter and style, I've found that the key to teaching well is to break down the materials at hand, and articulate them in a way targeted to the audience. This is especially crucial when running a weekly or twice-weekly 50-minute recitation section. Given the limited time, I have to get the main message across to my students in the first 15 minutes, and leave enough time for other activities such as cooperative exercises or quizzes. So while preparing for each section, I ask myself the following questions:

- "What materials have the students learned in the past week?"
- "What problem-solving mechanics are involved?"
- "And what misconceptions might students experience with the materials?"

By ruminating over these questions, I devise an overall theme for each section, and boil the materials down to 2 or 3 "bullet points," which I deliver to the students right at the beginning. To help organize my message, I often prepare a handout outlining the main arguments presented in class, and invite the students to fill in the necessary steps.

Take the 1D wave equation as an example. In my teaching experience, I've seen students conflate waves on a real line with (standing) waves on a closed interval. So the first thing I speak on this subject, before diving into the math, is that the general solution is a linear combination of left-moving and right-moving waves (i.e., d'Alembert's solution, though I do not say this). My purpose here is to give the students an intuitive but accurate impression of what a wave is, before they start the actual computations. Then I elaborate upon this point by explaining how to mathematically represent a right- or left-moving wave, as well as the linear superposition rule. (The actual justification of d'Alembert's solution can then be left as an exercise in chain rule.) Finally, I explain how imposing boundary conditions leads to reflection of moving waves. It is then that I discuss standing waves: that is, on a closed interval, the travelling waves and their reflected counterparts add to create standing waves (an exercise in Fourier series and trigonometric identities).

A valuable thing I've learned from teaching, as well as from my own research, is to balance common sense with nitty-gritty calculations. This is especially important in a math or physics course for engineers, where problems are drawn from real-life applications. My mission then is to help students match their problem-solving skills with their instincts in quantitative reasoning. To this end, during problem sessions I often pick problems which allow more than one strategy of attack, or have solutions where one can perform a "sanity check." I let my students work on the board in groups for 15 minutes, followed by presentation of solutions by each group. When appropriate, I will follow up with such questions as, "Can you check your solution against this known special case?" or "Does your strategy apply equally well to this slightly altered version of the same problem?" Students learn best when they can discuss strategies with their peers and talk their solution out loud.
I take great responsibility in being a teacher to my students. As a son of a university professor and a high school teacher, I know what it takes to do the best class preparation possible, in order to present the material in an enthusiastic, persuasive manner. At the same time, I try to be attentive to individual students’ needs: this starts from learning every student’s name by Week 3, to being available for students’ questions and consultations during office hours. Based on in-class feedback and course evaluations, I believe that most students respond well to my teaching. And I take genuine pride when my students perform well at the end of the course.

As a mathematical physicist, I enjoy explaining the workings of the physical world to the layperson as well as the mathematically inclined. Everything I do in my teaching reflects my enthusiasm for math and physics. I look forward to many more teaching opportunities in the future.