Statement of Teaching Interest

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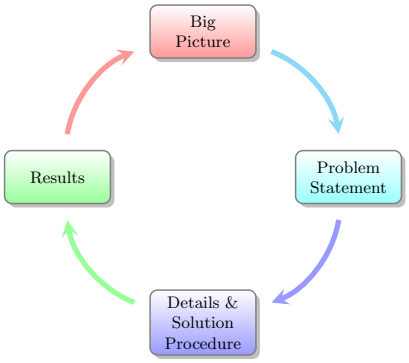
Teaching is a process that can be modeled as a constrained optimization problem. The objective is to maximize the understanding of the students, and the constraints are time and a priori knowledge of the students with possibly different backgrounds. This is a convoluted optimization problem because, first of all, the solution is not unique: there is no one right way to teach. In addition, the teaching environment is highly variable: a teaching strategy that is effective for scenario A does not necessarily suit scenario B. As a result, an effective teaching strategy cannot be static. A dynamic strategy, that is adaptive to the environment in real-time, creates an interactive atmosphere that allows teachers to "fine tune" the process accordingly. My basic teaching philosophy constitutes a cycle of procedures that I follow, yet adaptively modify depending on the topic and the students.



The Big Picture: Clarity in the transfer of ideas from the teacher to the students is obviously vital. However, it is equally important to capture the interest of the students as well. Students can be easily distracted if they do not know the goal of the lecture, the big picture, or the "so what" of what they are learning, even if the explanations were perfectly clear. I always give an exposure of the big picture using examples that motivate the significance of the topic to be studied. This can be done in a hierarchic fashion by motivating the course, then each chapter and finally each lecture. I strongly believe that the easiest way to capture the students' attention is by triggering their interest through smooth delivery of ideas.

The Problem Statement: I believe that fully understanding a question is half the work to find the answer. For that reason particularly, I invest time on formulating the problem statement clearly so that the students build a model in their mind for the problem at hand. Once they do that, they automatically start thinking of the solution, even before the teacher addresses it. For example, when I was teaching a class on temperature control, I had to show the solution of the heat partial differential equation. Instead of writing down the heat equation and immediately start crunching through the mathematics, I spent some time on qualitatively discussing the heat equation itself. This helps the students gain enough physical intuition and view the mathematics as a tool to rigorously bring their intuition to concrete equations.

Details & Solution Procedure: After I make sure that the students understand the question, my goal is to "guide" them to the answer. This stage is the perfect time to initiate an interactive atmosphere. In many situations, especially in the graduate levels, the answer is not as important as the process that leads to the answer. Giving students the opportunity of finding the solution to a problem statement develops their skill in critical thinking and triggers their scientific curiosity.

The Results: Stating the solution to the problem at hand is very important. However, it is equally important to ask the following two questions: (1) how and (2) why? The first question connects the results with the solution procedure by helping the student understand how the solution is obtained. The second question is perhaps the most important stage. It connects the results with the big picture. This is what precisely helps students to "close the loop" and check their understanding of each step: the question, the answer and the "so what".

The implementation of such strategy varies depending on the course and the students. However, I strongly believe that technology eases the implementation on both the professor and the students. The proper use of technology facilitates the delivery of ideas, especially in engineering disciplines. My goal is to make use of all technological resources to make the students have only one single concern in class: to understand. Such resources include but are not limited to course-management tools, presentation software, and tablets for lectures.

Throughout my graduate life, I have held many teaching positions that helped me develop and use this strategy. I taught undergraduate and graduate courses, and I also served as an instructor for several lab courses (refer to my CV). I am constantly asking for feedback from students and professors to adaptively modify my teaching methods. The multidisciplinary nature of my study areas (in mechanical and electrical engineering) makes me suitable for teaching positions in a broad spectrum of engineering courses. I have been given the "Best Teacher Assistant Award" in the mechanical engineering department at UCSB, 2015. This outstanding recognition encouraged me to pursue a career as a professor. I believe that it is not a coincidence that a professor's duties are both teaching and research. These two intimate jobs complete each other. I found my self several times asking a research question and adding to my knowledge after giving a lecture. This always reminds me of the well-known old Latin principle Docendo discimus: "the best way to learn is to teach".