

**"The mind is a fire to be kindled not a vessel to be filled."**

**....Plutarch**

## **TEACHING PHILOSOPHY**

The job of an academic is seemingly split into two very different activities: research and education. As my teaching and research experience built up and my philosophy crystallized, I came to realize that these two aspects of my job are inextricably connected. Both feed off each other to sustain my belief that understanding through scientific activity is crucially important to creating a better world. Being a researcher has made me a better teacher because I have experienced first hand how very cool it is to make discoveries about the world and how very difficult it is to organize your ideas in a coherent way that is accessible and interesting to others. It has given me experience and excitement that I can try to transfer to my students. Being an educator has made me a better researcher by forcing me to think deeply about the structure of familiar mathematical concepts and how to rebuild this structure from scratch for my students.

I started teaching five years ago as an adjunct lecturer at Brooklyn College and have been teaching for the past three semesters as an assistant professor at the New York City College of Technology. I taught courses ranging from College Algebra and Pre-Calculus to Statistics and Probability, Calculus, and Linear Algebra. I have mentored students in projects on lives of famous mathematicians, theoretical Computer Science, and Dynamical Systems. Recently I had the great pleasure of hearing my student give an hour long talk in the mathematics seminar on theoretical models of computation. I am planning new projects on the history of early Number Theory, Cellular Automata, and writing software for interactive web based games.

My main goals as a teacher are to get my students excited about learning, to convince them that learning is something they should pursue throughout their lives, and to give them the rudimentary tools for this purpose. Most students will not retain the factual knowledge from a course too long past the final exam. But a good teacher has the ability to leave them with a sense of awe that comes from discovering how complex and elegant the world around them is and the know how of making the discovery. I try to accomplish this by focusing on three key areas: the content, the performance, and the interaction.

One aspect of the content of a course is how to best organize and break down the concepts. A method I like to employ is to rediscover the concepts along with my students, starting from leading questions and proceeding to solve the mystery one step at a time. Performance also plays a key role here because it is necessary to capture the students' interest and make them believe that the mystery is worth solving. Another aspect of content is how to best combine the familiar concrete examples with the foreign abstract thought. My own experience has taught me that concrete examples are crucial for building an intuition, but abstract thought generalizes beyond a particular subject and best builds critical thinking. This biases me more toward the abstract than the concrete, although I recognize the essential nature of both. A way to help students develop abstract thought is to train them to effectively use language. Languages are treasure troves of abstractions. By learning to carefully organize and express their thoughts orally and in writing, the students learn the power of abstraction and generalization. I realized this only recently and have since begun emphasizing written and oral projects. Another very important aspect of content is introducing students to the remarkable technological resources that are available to their generation. No other generation has had at their fingertips nearly all information ever produced by the human race. Mathematical software such as Matlab, Mathematica, and even the graphing calculator has completely transformed mathematical computation and visualization. These resources make independent lifelong learning accessible to

everyone for the first time in history. I consistently integrate mathematical software into my courses and design projects that encourage my students to explore the information available on the web.

The content of the course are the tools through which a student learns, but even the best tools are often insufficient to motivate learning. This is where the performance on the part of the educator is required. The best written play about the most relevant subject that is not well acted will not convince the audience that it portrays reality. An educator whose aim it is to convince students that learning is worth their effort and relevant to their lives must play the part. She must be able to convey to the students her excitement about learning, its importance in transforming the world, and simply that she cares whether her students learn or not. It takes a great amount of time and effort to reach a stage where a subject is appreciated for its beauty or usefulness. This is far greater than the time most courses afford. By performing her part an educator can serve as a role model of such an attitude and the students' empathy with her will translate into their sympathy for her subject.

The best performance, the best content, won't help if the students are not engaged. I try to interact with the audience and engage them in participation whenever possible. Though it can be hard, I try to keep in mind that neither classrooms nor conference halls are about me. Learning takes place through the voluntary and active involvement of the audience. When I step into the role of an educator, my part is to initiate and direct but not to dominate. How I direct a lecture, what I emphasize, and how much I say or leave for the audience to decipher depends on the response that I receive from them and their interactions with each other. A silent, passive audience is usually a warning sign that no true learning is taking place. Such an audience needs to be engaged by a more personal presentation that demands involvement and that is not abstract enough to lose them further. Once an audience becomes active they can handle and usually demand a more precise and abstract level of presentation.

The world we live in is greatly complex both on the natural and social levels. The academic as an educator/researcher serves the role of an emissary to promote active understanding of and involvement in the world. Our job is to pass on convincingly the knowledge we acquired specifically of our subject matter and generally of the tools needed for independent lifelong learning.