

Statement of Teaching Philosophy and Experiences

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My experiences as an instructor and as a teaching assistant have helped me to make some useful observations about the way students learn and, more importantly, about the teacher's role in this process. Planning and thinking critically with regard to objectives provides a blueprint that I can then use to maintain focus in my teaching methodology. And, as my chance to become a leader of the classroom approaches, I have reflected on these goals and my progress towards them.

In my experience, one way a student acquires knowledge, is by spending what may be called quality time with a subject. In my role as instructor, I try to facilitate this. To accomplish this, I aim to impart to my students what I have learned from my research and from my time as a student. I also try to incorporate novel approaches to convey material. I assign elaborate projects in order to guarantee hands-on experimentation. I consistently keep in mind the important fact that many students may be new to the university or college campus setting, and endeavor to make lecture useful and interesting. For those students who want research experience I have a repertoire of research problems in ongoing research with which to excite their curiosity.

In an introductory programming principles course, I produced a programming project specifically designed to reinforce key principles of object-oriented programming (OOP). It also served the underlying goals that the students see a near perfect analogy between an object and the abstract thing it represents and that they recognize the usefulness of OOP. The basis of the project was very natural: complex numbers. The students were able to see that an object of class `Complex` and a complex number are almost identical except for the abstraction. They also got a chance to use their creations with client code; this illustrated how OOP made practical use of the abstraction.

When teaching lower-level students, I have taken particular care to pay attention to their individual study habits and abilities and to their knowledge about an institution's resources. Often times new students are not aware of the myriad resources available on campus: office hours, peer mentoring, email, newsgroups, etc. I certainly remember a time when I did not even know what office hours were. Early in a semester, I vigorously advertise my email address, my flexible office hours and office location and put forth the idea that I am waiting in my office to chat with them about their problems in the course. These constant reminders bear fruit when students are stuck starting a proof or they cannot get their code to work. When I receive visitors I try to create a relaxed atmosphere where they feel comfortable discussing their issues in the course. Often times I can easily identify such issues and cook up a toy problem that illustrates the critical, elusive features. I am then able to lead them to resolution. Sometimes they merely want advice as to how to study for the course. This informal environment allows me to build trust and open dialogue with the students.

In my courses, lecture represents the primary source of guidance for my students. Thus, my lectures strive to preserve their interest and direct their learning. One summer, on the first day of my numerical analysis course, I dragged a huge, empty television box into lecture. It got everyone's attention and I used it to drive home the fact that all scientific computations, though they may be infinite in nature, are performed in the restricted universe of a particular machine's memory space, much like the confines of the box. In another course, I designed and emceed a Jeopardy-style game that helped my students learn about inheritance and polymorphism in Java.

As a new faculty member, I plan to engage students in research projects that will utilize what they have learned in the classroom, push them to expand their knowledge base and show them the tools and methods available to researchers. I will meet periodically with them to discuss their

project and get reports on progress and results. I will give them advice on methods, techniques and on where to look for answers. My overall goal with regard to undergraduate research will be to give the young researcher a viable project that will promote self-sustained, life-long learning. From my research in numerical analysis, scientific computing, mathematical modeling, nonlinear dynamics and ordinary and partial differential equations, I know of many interesting questions that need resolution and that are well within the reach of an undergraduate researcher. I also have interesting applied projects that will add to any student's mathematical experience. In the case of a student about to start a graduate research program, I will, in addition to the above, give them more insight as to what to expect in such programs. In either case, the student will also get experience and guidance in giving technical talks, like how to assess and adjust to an audience's technical expertise and to truly appreciate the importance of oral communication in all aspects of life. An undergraduate researcher under my tutelage will be prepared for performing research in a team of researchers at Google or at Cornell University.

I have learned much from my teaching experiences. However, I recognize that teaching is an art, a continuum, like a fluid in constant evolution. Such observations drive my future plans and force me to set the bar ever higher. I am eager to work hard as a young professor, guiding students through to mathematical enlightenment, engaging them in undergraduate research and giving them the tools to become lifelong learners and applied mathematical researchers. I will continually reflect on and monitor progress towards my teaching goals in an effort to perfect this art form.

Detailed teaching experiences:

Cornell University, Ithaca, NY
Computer Science Department

COM S 322 Introduction to Scientific Computing
Summers 2005, 2003

Instructor

This course aims to introduce students to topics ranging from function interpolation, to the solution of linear systems, to numerical quadrature, to the numerical solution of initial value problems. Recently it has taken on a statistics component beginning with basic probability and logically progressing to analysis of variance and goodness-of-fit tests.

Prepared and delivered lecture four days weekly for six weeks to about 25 students predominantly from the majors computer science or electrical & computer engineering. Developed a course curriculum that successfully negotiated the time-pressured six-week course length constraint. Designed weekly problem sets and quizzes. Designed and graded exams, assigned course grades, managed a teaching assistant, moderated the course newsgroup and maintained the course website.

<http://www.cs.cornell.edu/courses/cs322/2003su/>
<http://www.cam.cornell.edu/~pangchj/cs322.htm>

COM S 100M Introduction to Programming
Spring 2006, fall 2004, spring 2003, fall 2002
Teaching assistant

This 4-credit course is offered every fall and spring, and teaches around 200-300 students the basic principles of programming. The target students are those who have little or no programming experience. The aim of the course is to give an introduction to problem solving and the computer implementation of such solutions.

Graded a portion (a random sample of around 20 of the population) of COM S 100M student submissions on a weekly basis. Prepared for a section or lab of 15-40 students. Led students in hands-on practice creating programming solutions to mathematically flavored problems (This accounts for the M in COM S 100M) using either a paper and pencil solution-creation forum in section, or an exercise-led, practical laboratory, in which the finished product is a working executable generated from either Matlab or Java. Held office hours where I could more easily gauge each student visitor and more accurately determine the source of the student's misunderstanding. Designed and supervised the grading of a programming project for the population of COM S 100M students the aim of which was to reinforce programming principles being discussed in lecture and to develop problem solving skills. Beyond the standard duties of a COM S 100M teaching assistant, I have, at various times, in coordination with Professor Fan, led weekend review sessions, helped in extracurricular weekend help sessions and was more than happy to provide flexible access to myself for students who wanted more help or to students who could not visit me during my regularly scheduled office hours.

<http://www.cs.cornell.edu/courses/cs100m/2006sp/>
<http://www.cs.cornell.edu/courses/cs100m/2004fa/>
<http://www.cs.cornell.edu/courses/cs100m/2003sp/>
<http://www.cs.cornell.edu/courses/cs100m/2002fa/>

COM S 322 Introduction to Scientific Computing
Summer 2006, spring 2005
Teaching assistant

Prepared and delivered lecture twice weekly to sections of about 30 students each about peripheral, yet germane, numerical analysis topics meant to bolster ideas from lecture. Held office hours where I used this one-on-one forum to better address each visiting student's confusions. Marked student submissions for progress towards a paradigm solution. Managed peer graders while marking papers. Outside of these duties, on occasion, I presented deeper mathematical analysis via preparation and distribution of extra-curricular handouts.

In the summer version, I: Prepared and delivered a series of presentations showing students the practical application of the concepts presented in lecture using my research as a setting. Marked student submissions. Helped in creation of homework solutions and exams. Managed the course web site. Held office hours.

<http://www.cs.cornell.edu/courses/cs322/2005sp/>
<http://www.cam.cornell.edu/~jhb9149/cs322.htm>

COM S 421 Numerical Analysis

Fall 2005

Teaching assistant

An honors version of COM S 322.

Held office hours. Marked student submissions according to how much progress was made towards a model solution, where the level of required rigor is substantially elevated, as compared to COM S 322.

<http://www.cs.cornell.edu/courses/cs421/2005fa/>

COM S 099 Fundamentals of Programming Concepts

Summer 2004

Teaching assistant

This gentle introduction to programming serves to prepare those who feel they are not yet adequately prepared to take COM S 100.

Provided about 20 students very attentive help during practical laboratory sessions using Matlab. Held office hours in the student computer laboratory. Gave hands-on, practical help in this laboratory where the students developed solutions to their project assignments. Graded student project submissions.

COM S 624 Numerical Solution of Differential Equations

Spring 2006

Grader and substitute lecturer

Marked and provided feedback on graduate student submissions. On several occasions, prepared and delivered lecture when Professor Vavasis needed to be away. On such occasions, fielded questions from a diverse audience of graduate students from various engineering and science disciplines.

<http://www.cs.cornell.edu/courses/cs624/2006sp/>

Cornell-Ithaca Mathematics Enrichment Program

Springs 2000, 1999

Program assistant and mentor

Introduced minority, Ithaca-area high school students to college-level mathematics research using Matlab and Mathematica in computer laboratory sessions on a weekly basis. Mentored a group in the completion of a project exploring Julia-like sets under different complex mappings

Mathematical and Theoretical Biology Institute

Summers 1999, 1998

Student mentor

Mentored groups of college students representing a diverse ethnic, socioeconomic and geographic makeup from around the United States in the development and production of original mathematical modeling research.

University of Texas at San Antonio, San Antonio, TX

Texas Pre-freshman Engineering Program

Summers 1996, 1995, 1994

Program assistant and mentor

Managed a classroom of 20 high school students. Mentored them by providing mathematical challenges, assigning stimulating readings and posing questions requiring critical thinking. Tutored students in mathematics, technical writing and statistics.