Why I teach

I have always wanted to know how everything works, interconnects, and evolved. That moment when a flash of insight shines a light on the underlying structure of nature is an incredible feeling. Like many researchers in science, I willingly subject myself to experimental failures, difficult-to-interpret results, funding difficulties, and long hours in order to receive that momentary feeling.

I teach because I want to share the excitement of discovery and knowing, and I want others to be able to experience that excitement for themselves. It is also quite rewarding to see the glimmer of insight in my students eyes when they finally reach understanding for themselves.

General Goals for Students

Desire and Excitement

If my students are *only* interested in learning the material I am teaching to earn credit, then I have failed as a teacher. I want to covey at least some of my excitement in the subject to them. Perhaps it's naïve, but I think that once students are excited about the material, they are more likely to succeed.

Informed Skepticism

While only a small percentage of my students will become scientists, I want them all to know how science works, how to analyze claims, weigh evidence, do background research, and come to an independent understanding of nature. From politics to the latest false claim on the Internet, an ability to become informed, think critically, and analyze skeptically will help my students be conscientious members of our democratic society.

How I Teach

Task Analysis

For each course, I identify course-specific overall goals that I want all of my students to achieve. Then, I plan a path to these goals, with a hierarchy of sub-goals along the way. This enables me to measure the effectiveness of my teaching and the students' progress at each step during the course. For example, in an introductory bioinformatics course, an overall goal might be to have students be able to use common bioinformatic databases to answer biological questions. A corresponding sub goal would be for students to be able to use dbSNP to select all genetic variants in a specific gene in a specific organism.

Learn By Doing

Even though lecturing, demonstrations, and similar passive learning techniques are important, everyone learns best by doing. Mistakes, failure, experimentation, and learning from them are important parts of learning by doing, just as they are in science. To the greatest extent possible, I want to provide opportunities for students to learn by doing. I want students to learn by solving problems using the knowledge and resources they have gained in the course.

Individual Engagement

In large courses it is very difficult to keep individual students engaged, as they feel they are just one face in a hundred and have limited opportunities to ask questions. When lecturing, I like to combat this by asking students questions directly, and getting

students (even those at the back) to participate in demonstrations. I will also be accessible both in-person on campus, and via e-mail. Finally, I will encourage my teaching assistants (TAs) to be engaged with our students by asking TAs about students in their sections in TA meetings.

Students Teaching Others

Having every student engaged with a teacher is a laudable goal, and may be achievable in small in large ones, there will always be some people who are not reached. Students teaching other students is one method of extending a teacher's reach. In the past, I have had online forums or mailing lists for all courses that I have taught. In these forums, students are able to ask questions, and other students are able to answer them. In addition, students are able to reinforce their learning by answering other student's questions. You know a concept when you can teach others.

Technology

Classroom technology is very useful in increasing the ability of students to learn, experiment, and measuring outcomes in the classroom. I plan on using:

1. Interactive websites to enable student's active learning by doing, including exercises, experiments, and other activities.
2. Real-time online feedback using automated grading on a website to the extent possible on homework so students know whether they understand the material.
3. In-lecture questions through clickers or smart phones when the course is too large to gauge student understanding of material by asking questions of students or raising hands.
4. Recording lectures so that students (and I) can refer to them later.
5. Forums, mailing lists, and other communication methods so that students can learn cooperatively. When students explain material to other students, it answers other student's questions and reinforces their own knowledge.
6. Demonstrations in class and online, both real and simulated, when appropriate to the material being taught.

Measuring Outcomes

Success and Failure

I'm continuing to study how to be a more effective teacher by learning from other teachers and research into teaching techniques, and will continue to do that as long as I teach. I will measure the outcomes of my teaching in order to determine how effective I am. By correlating the teaching methods I use for each sub-goal of my course with student outcomes, over time I can identify the most effective teaching strategies for me.

Teaching Experiences

Teaching Assistant

While a graduate student at UC Riverside, I was a teaching assistant for Introductory Biology[1], Introductory Genetics, Molecular Biology, and Developmental Biology.

[1] http://www.biology.ucr.edu/courses/UGcourses.html