T e a c h i n g S t a t e m e n t
E r i n P e a r s e

According to my students, I am a tough but exceptionally talented instructor:

- “Thank you for an amazing semester. Your enthusiasm for math is inspiring to me. I have learned more from your class then I remotely expected. The world looks different to me now.” (ODE, FALL 2011)

- “I just clicked with Dr. Pearse. It’s like my mind and his are sync’d up somehow. The way he explains things in class, is the same way I think about things. That’s part of why I was able to learn so much. I think maybe the most important thing though is that this class somehow reignited my long-dormant love of mathematics. For the first time since being at college I’m actually excited about being a math major. Dr. Pearse was a big part of that because he didn’t ever try to dumb things down and never hesitated to give us glimpses into what was to come later in studying mathematics ... I could go on and on but I won’t.” (CALC IV, SPRING 2011)

- “Dr. Pearse is a wonderful teacher. By far the best teacher I have had in college. Don’t change anything. Erin is an excellent professor and I will be taking as many classes as I can with him before I graduate. The fairness in grading and his overall care for our understanding and interest in this subject made his class unlike any other.” (CALC IV, SPRING 2011)

- What is your overall opinion of this course: “The highlight of my college career so far, because I got lucky and found an instructor I love.” (CALC IV, SPRING 2011)

- “This is my second time taking Calc IV ... I know what this class is like when it’s taught badly, and in contrast, this semester I really feel as though I understand the material. Pending my performance on the final, I can make an A, and that’s something I didn’t even dare to dream of when I was taking it before.” (CALC IV, SPRING 2011)

- “Instructor was a good, clear communicator. Instructor is also obscenely good at drawing 3d things on chalkboards, I’m pretty jealous.” (CALC IV, SPRING 2011)

- “Time spent working on homework in class was more than double any other class I have taken.” (CALC IV, SPRING 2011)

- What were the strong points of the course? “Unfortunately, ‘everything’ isn’t a ‘specific strong point,’ so I have to go into more detail. The subject of the course was interesting, useful, and of appropriate complexity for its level ... the problems in the text that were assigned for homework were neither frustratingly complicated nor so simple that they seemed like useless busywork. Dr. Pearse was engaging, well-prepared, intelligent, excited about the subject and math in general, helpful, fair, and fun. If I missed any aspect of the course, it was probably good too. It was the best course I have taken so far at the University of Oklahoma.” (ODE, FALL 2010)

- “Department heads, if you’re reading this, do not lose him! OU needs more math professors like Dr. Pearse, who actually understand how to translate concepts into terms students can understand. I was dreading taking this course based on the horror stories my friends had told me, but Dr. Pearse managed not only to explain the material so that we understood the underlying concepts, not just the procedures, but also to make it entertaining. Yes, that’s right, we had fun in a math class.” (ODE, FALL 2010)

- “What were the weak points of the course? “This course caused me to enjoy my other courses less by causing me to compare them to this course.” (ODE, FALL 2010)

- “he’s animated and enthusiastic, and he really knows what he is talking about and how it relates to the math world as a whole. And he’ll tell you about it! He will mention some complicated math theorem or specialization and make it sound really, really interesting. He keeps the class a speed that is fast enough that we don’t get bored, but slow enough that he can fully explain everything he writes.” (ODE, FALL 2010)

I put these comments first because I value student opinion and I am pleased when they come to me at the close of a course and ask me what I am teaching next semester. Even after just covering a class for a colleague, I often have students ask for my name and what I am teaching next semester, and I consider this a great compliment.
In my experience, students find mathematics challenging because of a combination of factors: the abstraction, the inherently cumulative nature of the subject, and the required attention to detail. To address these factors, I follow three general principles: context, consistency, and practice.

**CONTEXT.** I begin each lesson with a brief introduction that gives the students a rough understanding of the new concept and how it fits into the broader scheme of the course; a top-down view. Whenever possible, I exploit previous lessons and examples to frame new ideas. This allows me to introduce new ideas on a model that is already familiar to the students, and I can crisply highlight the material from the current lesson via contrast with previous lessons.

**CONSISTENCY.** I set up examples in a uniform manner so that the methods are crisp and clear. For example, when solving a 1st-order linear ODE, I (1) write the equation as \( y' + p(x)y = q(x) \), (2) identify \( p(x) \), (3) compute the integrating factor \( \mu \), (4) multiply the ODE by \( \mu \) and verify that the left side is now \( (\mu y)' \), (5) integrate, and (6) solve for \( y \). I always repeat (and number) these steps the same way. I do not require that my students follow this rigidly consistent pattern, but I know it brings familiarity (and eventually confidence) to the students because they know exactly what I am doing, where I am in the problem, and what is coming next.

**PRACTICE.** I believe *mathematics is learned by doing, not by watching*, and so homework is the most important part of the learning process. If you read my evaluations, you will see many remarks about how (a) I assign a massive amount of homework, and (b) I will work with any student until they understand and complete it. I am also very enthusiastic about urging students to attend office hours, and I allow them to turn in assignments late whenever they need to meet with me for assistance.

**CLASSROOM TECHNIQUES.** I cycle through the class and ask questions of the students individually. In addition to keeping the students alert and engaged, it helps me gauge how well the class is following the material, learn students’ names rapidly, and monitor attendance. Students can always “pass” a question without any repercussions — I just move on to the next person. This method is extremely effective at engaging the students; it creates a student-centered classroom and highly participatory environment while avoiding intimidation or embarrassment.

I have had great success getting students to present material — typically homework exercises for lower-division courses, maybe a theorem for an upper-division course. Students generally perform markedly better on exam questions dealing with a topic on which they have presented. *This practice gives students valuable experience with presenting technical material to others, an underemphasized skill which is crucial for advancement in almost any skilled career.*

I often write supplementary problems or extra-credit assignments; self-contained “mini-units” which guide the student through a tightly focused circle of ideas. This allows students to explore topics for which there is not sufficient time in the course. For example, my current ODE course has many petroleum, chemical, and mechanical engineering students, so I have put together extra credit assignments modeling hydrology experiments, groundwater contamination, chemical mixing problems, and the Watt governor (a feedback control in his famous steam engine). Some examples are available on my web page.

There is also something to be said for a little repetition during lectures. Even though I sometimes feel silly doing it, I make a point to reiterate the steps and principles of a technique each time I do an example. I believe it is very important for the instructor to repeat key ideas; sometimes in the same words, and sometimes in new words. It is not reasonable to expect that everyone catches everything the first time they hear it, especially while taking rapid notes or pondering a previous comment. Avoiding such multitasking is also why I make my lecture notes available to students before lecture.

I also like to inject a little levity into the lecture. “One morning, the mathematician was about to make tea, and he found the kettle on the floor, so what did he do? ... He picked the kettle up and put it on the stove. The next morning, the mathematician found the kettle on the counter, so what did he do? ... He
put the kettle on the floor, thereby reducing it to a problem already solved.” However, there is a serious message here, one that I repeat throughout every course: *whenever possible, use previous results to assist with the problem at hand.* All of my students know what I mean when I tell them to “kettle” a problem.

**Technology.** As a former web site designer, I have always used the internet for interaction with the students and to facilitate the distribution of course materials to the class. Initially, I did this through web pages of my own design; more recently, campus-wide course management software (Blackboard, ICON, Desire2Learn, etc.) have made this even easier. At Cornell, I used MapleTA software to ensure that students read the text before coming to class (an online quiz with a couple of easy multiple-choice questions was due before each lecture). Currently, I moderate a bulletin board where students in my ODE class discuss homework problems.

Most people have primarily visual learning modality and computer-assisted lectures can assist in making the material more visual and dynamic. I use Mathematica, MATLAB (and the excellent web-based ODE explorers PPLANE and DFIELD) to demonstrate certain ideas pictorially during lecture (especially vector fields and parametric surfaces). I then give assignments that encourage computer interaction for deeper understanding of the material: students can investigate the consequences of perturbing different parameters without tedious calculations. For example, I wrote a Mathematica notebook (“convolutions.nb” on my web page) that I use in lecture to show students what convolutions look like. For homework, they are asked to compute and even animate their own examples.

While still in graduate school, I began a project of writing up careful expositions of various graduate and undergraduate topics for the benefit of younger students and other researchers, and I regularly receive grateful emails in regards to the LaTeXed notes I maintain online in the Materials section of my web page: www.math.ou.edu/~epearse/resources.html. These now form a large digital collection of repurposable educational tools, and many have found uses beyond the original course for which they were designed. In particular, I have found the handouts for “Sets and Maps”, “Proof Tips”, and “Guide to Notation and Logic” to be helpful for students in many different upper division courses. This allows me to provide extra resources to students and reduce preparation time while enhancing the quality of instruction.

**Teaching in a diverse environment.** As an immigrant, I understand the extra hurdles and challenges that must be overcome by minority students; I come from a poor background and had to work for years to obtain my citizenship. I married into a Mexican-American family, and my wife has taught elementary school for years in low-income and economically depressed districts. Often, the students from these areas have the least qualified teachers, fewer school resources, lowest rates of college-entrance preparation, and reduced participation in higher education in general.

Studies have shown that College Algebra (“Algebra 1”) is by far the biggest obstacle for disadvantaged students, and it is well-known that the statistics for high school and college graduation rates are extremely lopsided when comparisons are made between Caucasians and most minorities. This crisis requires that institutions of higher learning fully support those minority students who do make it to college. From personal experience teaching and tutoring entry-level mathematics courses throughout my graduate and undergraduate years, I understand the extra work required to help diversity flourish. As part of my commitment to underrepresented students, I became involved with the Alliance program during my stay at University of Iowa (one of the founding institutions).
TEACHING EXPERIENCE

ERIN PEARSE

Experience as primary instructor.

- UNIVERSITY OF IOWA. Lower-division: vector calculus, linear algebra, numerical analysis, undergraduate research. Upper-division: probability, complex variables. The research course had 7 students (sophomore through senior) and class consisted of lectures (many given by the students), discussions, and MATLAB work. Students worked in small groups on problems of their choice and gave presentations of their results.
- UNIVERSITY OF CALIFORNIA, RIVERSIDE. Lower-division: linear algebra for business, ordinary differential equations. I taught these courses as a graduate student (I had obtained my Master’s degree at the time, but not my Ph. D.)

Experience as teaching assistant (U.C. Riverside). Course assistance for set theory, discrete mathematics, advanced calculus, complex analysis, point-set topology, algebraic topology, plane curves (introductory algebraic geometry), number theory, optimization, game theory, ordinary differential equations, group theory, probability.

In addition to co-founding and directing the Summer Preparatory Seminars (a review for graduate students preparing to take Ph. D. qualifying examinations, led by more senior students), I ran the Real Analysis program for two years and the Topology program for one. Lectures and other material from these seminars appear on the Materials from courses I’ve taught section of my web page.

Other experience.

- Judge (and poster designer) for “Math Day” high school outreach event at OU, 2010–2011.
- Heartland Speaker at Grinnell College. The Heartland Partnership is a group of schools in the Midwest (including UI) that partner for various mathematical activities.
- Organizer: “Fractal Connections” summer conference. We had participation from the students at the University of Iowa’s summer REU program, and several talks were given by undergraduate visitors from neighbouring “Heartland Schools” on their own research.
- Mentor for the informal summer reading programs organized by motivated graduate students.
- Assisted in the summer REU program on fractals, run by Robert Strichartz. Bob typically has 6–10 students over the summer. I worked with three who were studying gradients on fractals, higher-dimensional Sierpiński gaskets, and energy measures on fractals.
- Co-founder and co-organizer of the Teaching Assistant Mentor program at UCR. In order to train more skilled and effective teaching assistants, senior graduate students would work with more junior graduate students by attending discussion section and meeting privately to discuss effective teaching techniques.
- As an undergraduate, I tutored mathematics for 3 years.