TEACHING STATEMENT

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I began teaching immediately after I graduated from college, and I have genuinely enjoyed every class I have taught since then. The classroom is a comfortable environment in which I meet students and engage them in something I really enjoy: mathematics.

My first teaching appointment was as a high school instructor of mathematics and physics for upper classmen. Then, as a graduate teaching assistant at the University of Kansas, I taught *Calculus I* and *II* both for business/biology and for science/engineering students.

My best experience in teaching so far has been at the University of Nebraska-Lincoln, where I have taught *Matrix Theory*, *Calculus III*, *Contemporary Math*, *Abstract Algebra*, and *Differential Equations*. Last spring, I had the opportunity to teach an advanced graduate class (*Integral Closure of Ideals and Rings*). I am currently teaching an undergraduate honors class for freshmen, *Math189H–The Joy of Numbers*.

This last class is structured so that students construct much of the content; by considering concrete examples and by looking at common threads, they make conjectures, which we then prove or disprove. This course has been a terrific experience. Students get a real feeling for what it means to *do* math; when we considered the idea of congruence modulo an integer, I could see them formalizing "rows of table" first into sets and then into equivalence classes.

My students sense my passion for mathematics, and they mention this in the teaching evaluations. In Spring 2006, one student switched to a mathematics major after taking my matrix theory class: I see this as a personal achievement. As I reflect on the reasons why teaching at the University of Nebraska-Lincoln has been such a good experience, I can see two main reasons: a very good teaching mentor, Jim Lewis, and being part of Project NExT. In frequent conversations with Jim Lewis, with other NExT fellows, and in MAA meetings I have explored many interesting perspectives.

While there are goals that may change from course to course, I believe that studying mathematics helps students develop skills, such as logical and critical thinking, useful in any career.

More and more, one has to establish efficient ways to exchange information. With its precise language, mathematics, as science in general, provides a great opportunity to develop **effective communication**. In fact, good communication is a *conditio sine qua non* in doing mathematics, since the material can be very abstract and therefore hard to communicate and to assimilate. For this reason, I teach my students to use mathematical language appropriately: I encourage students from calculus to write clear solutions to problems and to use symbols correctly; I ask students from abstract algebra to be very precise in their statements when writing proofs. So that students develop skills in writing math, I make sure that they have opportunities to read it: often I give them typed solutions just after a test or a quiz.

I view homework as a means of developing good communication. For this reason, I encourage *group work*. We benefit both from giving and from receiving an explanation. When explaining a problem to a friend we understand how deeply we know the material, and we build confidence with new ideas. In communicating with a colleague (and not with the instructor), students are very honest about what they do, and do not, understand.

I first learned about group homework at a Project NExT session, and I tried it for my Calculus III class. The students loved it and I was very impressed by the amount of work they put into it. They felt more engaged. Pushing this idea even further, in Math 189H, peer to peer discussion of take-home tests is encouraged as long as they make clear with whom they talk.

Another goal I have for my students is to develop **self confidence** in facing math problems. To make them comfortable in the process of learning, I ask students questions to which they should know the answers. Then when students make an observation I try to push it to a more subtle statement, so that they can feel how their intuition leads to non-trivial implications. Finally, I believe that doing homework is essential in building confidence in new ideas. For this reason, I regularly assign, collect, and return homework.

The hardest goal I set for my students is to turn the frustration of exploring the unknown into an opportunity to express their **creativity**. For this reason, I think that students should be exposed to open-ended problems. In Math 189H, for example, tests are extremely hard and I make it clear to students that I am as interested in the strategies they use as in their solution. The biggest danger is loss of students' interest. To avoid this I talk to students in private sessions and I spend a lot of time listening to their attempts. (Often I have to bite my tongue to avoid giving away an easy solution). As a reward, I have students coming to my office saying "I am so proud of myself. I did this all alone".

The best strategy to reach these goals is to keep students properly motivated. Then they are full of energy and they move rapidly toward the goals of the semester. For this, I make students an **active part of the learning process**. For example: when teaching students linear algebra, we face the problem of introducing the notion of a vector subspace. The notions of "closure" under addition and scalar product are too abstract for students taking their first class "with proofs" (as they often put it). So I give them a list of vectors in $\mathbb{R}^3$ and have them add any two vectors in the list, add the result to the list, and repeat. We have a similar activity with the scalar product. At the beginning, they start writing a list, but soon they realize that the list is quite long. Then I ask if there is a vector they cannot get with this process. It is a time-consuming activity, but by the time I state the definition, they all know what I mean. Likewise, I find that students remember general procedures better if they have an opportunity to make educated guesses beforehand by looking at examples.

I put a lot of effort in creating a pleasant **class environment**: (1) I try to show visible respect and concern for the students; (2) I encourage my students to have an active role in class, by asking and answering questions; (3) I write on the syllabus that, as a class, we want to establish a classroom atmosphere where mistakes become an opportunity to get better—not an opportunity for embarrassment.

Learning mathematics has different meanings: for engineering students it is problem solving; for math majors it is also understanding definitions and proofs; for non-science majors it is often being exposed to the versatility of mathematics. For all these different students, I want to be successful in making the learning process as effective as possible.

As a researcher, I think that mathematics is beautiful, and as a teacher, I think it is my duty to expose students to that beauty.