TEACHING STATEMENT

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1. Teaching Philosophy

I am a research mathematician. My love for mathematics derives from my love of exploration and discovery. In nature, art and science, I am attracted to complexity and the challenge of decoding complex systems by identifying the essential components of a structure. But, while we are all born with a need for mathematics (our lives depend on our human ability to reason), I realize that not all people are devoted to or even enjoy the challenge of understanding mathematics. While I am confident my dedication to research will yield scientific advances, I sincerely believe that my potential to positively impact our society is maximized by using my expertise to help others develop their own ability to use mathematics as a tool for understanding the world and advancing their education.

Of primary importance in any approach to teaching are methods of instilling confidence and perseverance in the student. While we occasionally are gifted with competent students that can be challenged and even considered as colleagues, the reality of university mathematics instruction is large groups of students that struggle with the pace of a university course and are often ill-prepared for the course. These students need to be identified immediately and the abilities of all of the students need to be assessed quickly. My experiences teaching as an adjunct at Northern Arizona University and more recently as a graduate teaching assistant at the University of Arizona have made me aware of the need to communicate with students individually and develop class room activities that allow me to assess the progress and capabilities of the students. I believe that individual familiarity with each student makes the student more accountable and willing to seek help from the instructor. One way I accomplish this familiarity is to start my class by assigning a short list of prerequisite problems for the course immediately and requiring each student to visit my office at least once in the first weeks of the semester. We must be able to anticipate the students' mathematical ability by ensuring an active line of communication with all of the students.

Another crucial modern tool for promoting interaction and familiarity with students is the enhancement of course with email and Internet resources. Nearly all students today are technologically savvy and are particularly responsive to email communication. I check my email morning, day and night to allow prompt responses to my students. The availability of an organized website with resources pertaining to the course is an extremely helpful tool for both student and instructor. As a rule, I keep summaries of homework assignments and test schedules on my course websites, and I have become actively involved in developing web resources for mathematics courses. Applications are key to motivating interest in mathematics and the course website is an excellent place to include interactive resources for helping students visualize mathematics and its applications. For example, as a teaching assistant at

the University of Arizona for MATH 322: Mathematical Analysis for Engineers, I developed several MATLAB Graphical User Interfaces for interactive educational purposes including a GUI built for visualizing solutions of Sturm-Liouville problems and mass-spring equations [1].

Even basic knowledge of mathematics can account for significant improvement of intelligent decision making and quality of life. Students who have taken my courses in Mathematics and Modern Society (Arizona) or Finite Mathematics (Northern Arizona) are sobered by computations of credit card debt scenarios and are confronted with the practical considerations of financing a house or business. They also take away a basic understanding of the language of statistics, a crucial tool in almost any modern working environment and a crucial tool for interpreting the scientific evidence that our decision making depends on. For students in the sciences, further mathematical expertise in linear algebra, analytic geometry and calculus is equally crucial for success. Although groundbreaking research can have a major impact on society, my conviction is that our surest way to improve society with mathematics is to provide education and awareness of mathematics to students and the general community. This can be done by appealing to students, general audiences and colleagues; of these three groups, students are the group for which we have the most resources (fiscal and temporal) available for promoting mathematical growth.

In the classroom, there are several habits I have developed that have an important impact on the student. Punctuality is absolutely essential in providing a professional appearance and example for the student. Out of basic respect for the student, I organize my lectures and classroom activities to take full advantage of time spent in class. I always use the minutes before class is scheduled to begin to write down the next assignment that is due and upcoming test dates in a sidebar on the lecturing surface. I allow the students who arrive early to suggest homework problems for me to overview once the course starts; this allows me to think about the particular problem and outline a solution strategy before the course begins. Of course, I wait for the course to begin and give everybody an opportunity to show up on time before actually addressing such questions. I am intolerant of classroom disruptions and rectify these problems in a sensitive but direct appeal to the source of the disruption.

In addition to being the sole lecturer and grader for more than a dozen mathematics courses ranging from college algebra and finite mathematics to calculus, I have worked as a teaching assistant for upper division graduate courses and have been involved in assisting my advisor with advanced undergraduate and graduate research projects. One of these projects, already described above, was the development of web resources for an engineering mathematics course taught by Dr. Joceline Lega. I also was an assistant to Dr. Bill Velez for a cross-listed (undergraduate/graduate) course in real analysis [2]; my duties were to hold office hours for graduate students who were taking in the course, and I administered several of the lectures on occasions in which Dr. Velez had out-of-town obligations. As a teaching assistant for graduate level courses in stochastic processes and stochastic differential equations [3], I hosted weekly problem sessions that allowed for graduate students taking these courses to discuss the problems together with a veteran of the course.

Finally, I would like to re-emphasize my identification of general audiences and colleagues as other targets of mathematical instruction. It is extremely important to appeal to large

general audiences in order to culture a appreciation of mathematics within society. It is vital that everyday people are aware of the importance of both mathematical research and mathematical education, and the only way to promote such awareness is to reach out personally to wide audiences with lectures, publications and workshops accessible to non-experts in mathematics. One particular set of experiences I have had with this sort of outreach is the presentation of interactive, 3-hour mathematical workshops to high school students and teachers from the Tucson area. Also, in addition to giving seminars on my research to audiences of specialists, I have given many colloquial talks to audiences of students and mathematicians who do not research mathematical probability and stochastic processes. I would like to continue this kind of community involvement and mathematics education and work together with faculty from other departments on applications of mathematics to natural sciences. This type of involvement creates connections within mathematics and the science that are essential for real progress and application of the theory.

2. University Courses

Northern Arizona University
Fall 2001
MAT 114 Quantitative Reasoning (2 Sections)
MAT 125 Precalculus (2 Sections)
Spring 2002
MAT 110 College Algebra
MAT 119 Finite Math (2 Sections)
MAT 136 Calculus I
Summer 2002
MAT 110 College Algebra

University of Arizona
Fall 2004
MATH 110 College Algebra
Spring 2005
MATH 110 College Algebra
Fall 2005
MATH 120 Pre-Calculus
Spring 2006
MATH 124 Calculus
Fall 2007
MATH 105 Math and Modern Society

References

[1] Lega, J. Math 322 Mathematical Analysis for Engineers. Spring 2006. MATLAB GUIs: http://math.arizona.edu/ lega/322/Spring07/mg.html .
[2] Velez, B. Math 525A Real Analysis in One Variable. Fall 2007.
[3] Wehr, J. Math 565C Stochastic Differential Equations. Spring 2008.