Teaching Statement

A Brief Review of My Teaching Experience

I began my educational career at the University of Vermont in the fall of 2005. As part of my graduate teaching fellowship I instructed one course per semester and worked as a tutor in the math department help sessions. I also was hired that year as the mathematics tutor for the UVM athletic department. In subsequent years I was primarily funded at UVM through research fellowships, although I received a second teaching fellowship for 2007-08. I obtained further instructional experience throughout my graduate studies by teaching evening or summer session mathematics courses through the continuing education department while also working as a private tutor. I graduated from UVM in May of 2012 having instructed a total of 10 courses, a list of which can be found on my CV. These include general education courses, developmental courses such as college algebra and pre-calculus, as well as courses in the calculus sequence and beyond. I should note that UVM mathematics graduate students are responsible for all facets of the course and are not simply graders or TA’s. I therefore had the opportunity to gain valuable experience with lecture design and delivery, course material creation, grading, and student-teacher interaction. I also became practiced at the use of technology in the classroom as all mathematics courses required the maintenance of a class-specific website or course management software. Several classes also required textbook-integrated course management programs such as WebAssign and Course Compass/MyMathLab. This was in addition to the use of mathematical software including Mathematica and Matlab which is discussed in the next section.

After graduating from UVM I came to Bennington College as a visiting assistant professor of applied mathematics. Here I have found that my enthusiasm for applying mathematics to real world problems fits in well with a liberal arts curriculum—although there was definitely an adjustment period as I had neither taught nor taken a mathematics course in the liberal arts setting before. This position has offered great latitude in terms the courses I chose to offer and the design and implementation of their respective curricula. While at Bennington I have developed two new courses, Orbital Dynamics and Dynamical Systems, Chaos, and Fractals, and have brought my own approach to two others. This includes new texts, material, and the use of mathematical software in Calculus I and Introduction to Applied Mathematics.

My Educational Philosophy

During my time as an educator I have slowly developed an individual pedagogical philosophy which includes both general and course-specific goals and methods. Other factors such as class size or schedule might alter logistics but these usually do not cause me to significantly modify my approach. I tend to place mathematics classes in to one of three categories: pre-STEM (e.g. college algebra or pre-calculus), STEM, and general education. In pre-STEM courses my main goal is to increase both competency and confidence in the student’s mathematical skills. To this end I tend to place more of an emphasis on frequent homework and quizzes and less on exams, labs, or projects. I have found that emphasizing smaller assignments with correspondingly smaller stakes helps to remove some of the
stress from the learning process and allows the student more opportunities to make adjustments. Repetition and regularity also helps students retain course material and deters procrastination. The higher feedback rate also allows me to quickly identify those students who are struggling due either to a lack of effort or prerequisite skills and encourage them to take immediate action. Quiz and test questions are usually taken directly from homework set to encourage students to complete the homework assignments and seek help when they do not understand certain problems. Mathematical software is used on a demonstrational level though it not usually a part of the curriculum or assignments. As students in these classes tend to exhibit less patience and are more easily frustrated, I emphasize homework-specific examples when lecturing and set aside more class time for questions. I also try to keep off topic discussions and tangents to a minimum as I have found that while they may make the class more interesting to a few students, they can confuse others and give the rest an excuse to tune out.

When teaching STEM classes, I emphasize theory and concepts to a greater extent and often take extra class time for further explanation or discussion. I try to utilize my specialty in applied mathematics and my broad scientific background to help students in the sciences forge a connection with the material. As in pre-STEM classes, coursework is aimed at students becoming competent in solving typical problems in the topic du jour. However, the grading structure places more weight on exams or, in lieu of exams, in-depth assignments and labs which focus less on repetition and more on derivation, application, or extension of the material. I also try to include classroom examples and homework problems requiring the use of computers and in particular mathematical software. In the past I have used Mathematica, Matlab, and Scilab for this purpose—the latter being an open source Matlab clone I chose to employ at Bennington due to limited budgetary resources. In the future I would also consider using Maple or other open source mathematical software programs such as Maxima, Octave, and Sage.

I have found that I tend to emphasize the use of mathematical software more than other professors and I believe that today’s science majors will benefit greatly from computer experience and numerical algorithms. I have therefore incorporated its use into curriculum in several ways. These have included typesetting lectures and/or notes which feature tables, graphs, and interactive plots—the ‘Manipulate’ function in Mathematica is a personal favorite in this regard—which serve both as supplements to the material and as examples of the program’s functionality. Software specific commands and code can then be referenced later or even ‘copy-and-pasted’ and adapted for a lab or homework problem. Students may also explore computational problems in class during group work by following along on their own computer as we input commands or write a small script in real time. This also provides me an opportunity to touch on some programming-specific topics which they might not otherwise consider. Homework assignments and labs also make use of mathematical software, first as a glorified graphing calculator and later students are taught to search for and use the many built-in features and functions not available on their TI-8X. Finally they are taught how to translating course material into useful algorithms. In particular, early labs often introduce basic programming concepts such as variables, arrays/lists, built-in functions while later labs explore loops, custom functions, and scripts. In Calculus I assignments have included using Rolle’s Theorem to locate solutions to equations (the bisection algorithm) and using the tangent line approximation to estimate nearby function values (Euler’s
Method) or roots (Newton’s Method). Examples from other classes include obtaining and visualizing solutions to first and second order differential equations, solving linear systems, vector/matrix properties and operations, and working with parametric, polar, and spherical coordinates.

With general education classes my approach may mirror that of STEM or pre-STEM courses and is strongly dependent on the particular topic. In these classes I also try to promote more in-class interaction and group work. My recent experience at Bennington has been especially helpful in this regard and I look forward to continued improvement in that area. Rather than shy away from mathematical software, I have found it to be a great benefit and utilize it almost as much as in my STEM classes—though not necessarily in the same way or with the same goals in mind. Students are still required to learn the basics necessary to use the software, though I have found it is better not to require general education students to build more complicated scripts from scratch. Instead I may give them a basic script which they can adapt for the given problem or a fully functional program with which they might explore a concept by changing parameters. Homework problems usually include step-by-step directions for using the software as opposed to simply ‘Write a script that...’ or ‘Use Scilab to...’ While initially frustrating the student (and the professor), the effort is ultimately worthwhile. For example students in my Introduction to Applied Mathematics class were, with the help of Scilab, able to explore interesting homework problems and final projects using Monte-Carlo methods, dynamical systems, modeling/model fitting, and graph theory which would otherwise be too computationally intensive or require tools beyond the scope of the class (e.g. calculus).

Lastly, I note that while my approach in the instruction of a particular class may differ based on course type, there are some goals common to all my classes. First, I hope to provide all of my students with the necessary knowledge and improved skills that will allow them to perform better in their next mathematics and science class. I try to instill in them an appreciation for the subject of mathematics and its role in the sciences and beyond. Furthermore, I like to remind my students them that they are closer to making the transition from student to professional than they may realize. I encourage them to respect themselves, their teacher, their peers, and their responsibilities. While I keep my standards for student performance high, I try to remain flexible with my approach if I feel that my goals are not being met. Finally, I am always willing to make adjustments and to experiment with different formats, materials, and teaching styles in order to improve the student experience and to better meet my goals.

Summary

I have obtained instructional experience at the University of Vermont and Bennington College which includes teaching a broad range of mathematics courses to various audiences, the use of technology in the classroom, and curricular design. I feel that this experience has prepared me to achieve immediate and continued success as an instructor for a wide variety of mathematics course. My goals and approach to teaching should fit in at most institutions of higher learning and I welcome the opportunity to continue to improve as an instructor and to work with future colleagues in developing and maintaining a modern mathematics curriculum.
Sincerely,

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