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Teaching Statement

I have always been, and to some extent always will be, a student. As a student I have sought knowledge not only to further my personal and professional interest in mathematics, but also in recreational activities such as scouting and skiing. Each of these endeavors has eventually given me the opportunity to share my interests, and I have done so as a camp counselor, as a ski instructor, and more recently as a teacher of mathematics. My experiences as a student and as a teacher are what have most influenced my teaching methods, and my desire to be an educator.

General Philosophy
The first thing I notice in any learning environment is the instructor’s enthusiasm for the material. If the teacher is excited about a class, it will be infectious. When teaching, I try to set the tone by maintaining a general excitement for the material. An example is teaching knots in scouting: a bowline, square-knot, or lashing by itself is not all that useful; however, if you motivate your instruction with the possibility of building a tower or catapult, your audience is usually hooked. I try to generate enthusiasm for the study of mathematics in the same way. Mathematics is full of nice results and techniques. These techniques by themselves are neat, yet they may be used as tools to answer practical questions. I feel that if a student has an idea about the role a given topic plays, (even if that is to develop more mathematical machinery) they will be more open and excited to learn. I try whenever possible to motivate mathematical learning with concrete real world examples.

As a student, I enjoy learning the most in environments where you have the opportunity to actively participate. In my classroom teaching I use questions as one method of achieving active participation. I encourage students to ask questions, not only at the beginning or end of class, but also throughout the course of a lecture. I will often ask the class as a whole to tell me the next step to take when working problems. Through the use of questions, I create an active classroom dialog. As a ski instructor, it was easy for me to demonstrate concepts in front of students. Still, the students didn’t really learn until they where given the opportunity to try ideas out for themselves. The same is true when teaching mathematics. In the classroom I use sample problems to actively engage students with course material. I will present a problem to the class on the board or with a handout and then allow the students a chance to work on it alone or in groups before presenting the solution. This gives me the opportunity to move throughout the class and see what aspects of the material are particularly troubling. Once the pitfalls are known, I can present the material from several different angles in hopes of giving students better insight. As a graduate student at Clemson, I had the opportunity to observe the “SCALE-UP” teaching method for a third semester calculus course, in which more emphasis is placed on group work and learning activities than on lecturing. The Scale-Up method gets the students actively engaged, and I implement similar interactive group activities to get students involved in my classes.

Calculus and C++ Classes
In calculus classes, one of my favorite activities to review differentiation or integration techniques is playing calculus bingo. Each student gets a handout with a blank bingo card and an enumerated list of answers for an unknown set of differentiation or integration questions. After students assign the known answers to the squares on their card, the game is played by writing a problem on the board and allowing the students to work out the solution. The game concludes when a student correctly matches five answers in a row on his handout. This activity works well in both small and large classes, and allows me to work lots of examples while still maintaining the class’s interest.

There are many concepts that are more easily expressed with the use of technology. When teaching parametric equations, I make use of web applets to show students how different functions interact. Graphing calculators are a great tool for fitting equations to real data sets. The equations found ultimately allow for the development of simple mathematical models that may be analyzed. While observing the SCALE-UP method, I had the opportunity to aid students with the use of software tools like Maple. The software gave the students the ability to quickly visualize concepts, as well as the capability to solve computationally
difficult problems in a short period of time. Being a student of numerical analysis, I especially enjoy the use of technology in the classroom, and plan to incorporate it whenever appropriate in my teaching.

No matter how great the classroom experience, mastery of any material comes with practice. In the mathematical sciences this is done by working problems outside of class. As a student, my preference has always been for classes where homework and projects make up a significant portion of the graded material. I do my best to extend this to my students by carefully grading homework assignments. Homework serves not only as a way of giving feedback to the students, but also to me as the instructor. Grading homework highlights the concepts I need to present carefully, and review more closely with students. When framed within the course objectives, class projects give students the opportunity to work on something that is of personal interest to them. I am currently teaching a C++ programming class for engineering students where each student must propose their own final project. The student projects include ray tracing, modeling the spread of infections, modeling gravity based particle interactions, and number theory applications. These projects make the course material (in this case the C++ programming language) more accessible. I look forward to teaching more classes in the future where real world problems can be pursued through the use of class projects.

Mentoring Research

Sharing research with other mathematicians in a one-on-one setting is very exciting. Over the past summer I mentored two summer students in an undergraduate research experience. The students were charged with using numerical simulation to explore the wake structures generated by moving elastic structures in Newtonian and viscoelastic fluids. To accomplish their task, I guided the students in the use of my viscoelastic immersed boundary code. They began by writing simple forcing routines for the moving structures in MATLAB, then generalized these routines to work with the C-code solver. By the end of the summer, the students were running simulations on a high performance Linux cluster. Their research experience concluded with the students writing a research report, and presenting a poster of their findings at the 2010 SACNAS National Conference. I really enjoyed working with the students. The experience forced me to break a large research project down into small, manageable parts. I also gained experience in asking questions and making suggestions that guided the students, as well as the direction of research. Mentoring the students allowed me to share not only my research, but some of the computational techniques I have learned (e.g. python scripting). I look forward to more mentoring opportunities in the future.

As my career in the field of mathematics progresses, my teaching philosophy will, without doubt, progress with me. I am continually learning and adapting in hopes of being a better educator, and look forward to the possibilities my mathematical career holds. I know that maintaining enthusiasm for the material and keeping the student an active participant in the learning process will always be at the center of my teaching philosophy. Teaching is a rewarding way to give back some of what the pursuit of my own mathematical interests have given me.

The interested reader may see more at: [www.ccs.tulane.edu/~jchrispe/Page_Teaching.html](http://www.ccs.tulane.edu/~jchrispe/Page_Teaching.html)