## Teaching Philosophy

As I watched a professor initiate three student debates, encourage interruptions, and lead the class towards an ethical discussion about scientific research, I realized teaching involves much more than coherent lectures, well-thought out assignments, and good communication. Three years ago, I began attending teaching seminars and finding good teaching opportunities in both the mathematics and physics departments. As a result of my experiences working with The Bridge Project,[1] Math Excel,[2] and Making Connections,[3] I developed a deep appreciation of various approaches available for teaching mathematics. I was awarded our department's 2005-2006 graduate teaching award, and started a teaching seminar this year to expose graduate students to our own faculty's various teaching techniques.

Beyond the traditional approaches toward teaching, I shape math courses to help students develop their overall mathematical abilities and their logical maturity. I incorporate over-looked skills, such as dimensional analysis, geometric reasoning, speaking effectively using mathematical language, and knowing when to trust one's own intuition into courses because they can help students develop their understanding of mathematics beyond computations and algorithms. For instance, from my work with Making Connections, I saw students dismayed and confused by exponential growth problems in chemistry, even though they had solved similar "context-free" problems in their math courses. After they developed dimensional analysis skills, however, these students formulated correct expressions for the problem using thought rather than textbooks. This experience has not been limited to physical science courses, however. In Math Excel, I routinely asked students to solve problems which were just beyond their individual mathematical abilities. Often, students became frustrated due to ineffective communication and mixing up the meanings of various numbers and variables. After helping these students develop the above skills, however, their group's communication improved and they began to know when and why their solutions were correct. When teaching, I emphasize these skills by pushing students to practice them during lectures, office hours, tests, homework, and group work. Ultimately, these skills help students trust their own thinking, and I believe these students will further develop their mathematics skills throughout life.

This approach requires an interactive classroom, and I work hard to have students talk and be involved in every course. When I taught three weeks of Math 255: Vector Calculus due to the professor's illness, I began the course by tossing a balloon globe to different students and having them answer questions about vectors. I goaded the class into discussions about review topics, and they voted on intuitive concepts. By the third day, the class was interactive, involved, and even a bit interruptive - but the benefits were worth it! Students thought aloud during lectures and provided the class with multiple solutions to a given problem. Incorrect answers encouraged others to think for themselves and correct their own understanding of the material, if necessary. In the first recitation, after a few groups had presented their work, I asked the class to evaluate the work (not the group). I chimed in myself, and as a class, we discussed the importance of presenting solutions clearly and concisely, both verbally and visually. Subsequent recitations became filled with debates as students discussed each other's solutions and the overall relevance of certain concepts and calculations. In addition to keeping the students engaged during class, an interactive classroom helps students learn from each other and develop a deeper understanding of the course material.

I love to teach. I incorporate different teaching techniques when they will help the students develop a deeper understanding of the material, and believe the same approach should be applied to the use of technology in the classroom. For instance, graphing technology should not replace a student's ability to graph a vector field, but it can help students understand the local behavior of a vector field with positive divergence. I look forward to further developing an effective teaching style with and without the use of technology.

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1. The Bridge Project. An NSF-funded project (**http://www.math.oregonstate.edu/bridge**) which bridges the gap between the way vector calculus is taught by mathematicians and the way it is used by other scientists and engineers. Math 255 is taught using the Bridge approach at OSU.
2. Math Excel. A group-based course (**http://www.math.oregonstate.edu/?q=mlc_excel**) modeled after Uri Treisman's Emerging Scholars Program model. Math Excel students average one grade improvement in their subsequent math courses.
3. Making Connections. An interdisciplinary introductory course designed to help weaker science students, who had strong math abilities, develop skills for problem solving.