Teaching Statement

My teaching philosophy has two foci. I believe firmly in implementing a syllabus and curriculum in the correct context for the students taking the course, whether the course be cross-disciplinary or narrowly focused. I am also committed to devoting additional energy, both in and beyond the classroom for gifted students and most especially for students in need.

In each of the five years I spent at the University of Toronto, I held a teaching position in a course created as a substitute for the previous calculus requirement for biology majors. Undoubtedly, we wanted the scientists to graduate with mathematical sophistication, but we had to comprehend that we were training biologists and not mathematicians. This course expanded the curriculum beyond calculus to include other types of mathematics applicable to biology. All the mathematics taught is used to analyze or viewed in the context of actual biological data. Since then I have taught a number of other courses, from a second year combinatorics class to graduate level courses. In each of these classes the focus and students are different, and I have adapted the curriculum appropriately. When I taught a mathematics course for computer scientists and engineers, I emphasized the breadth of industrial and technological aspects of the course, going beyond the pure mathematics. Conversely, when I have taught mathematics students I have enjoyed presenting the depth available.

No matter who I teach I find that giving real examples and applications and contextual discussion aids learning immeasurably. As discussed above, I used biological examples and data sets to enhance learning for biologists. When I taught graph theory to computer scientists, I showed how Eulerian circuits and Hamiltonian cycles give rise to efficient digital coding schemes for switches and analogue to digital conversion. When teaching them trees, I presented breadth first search and depth first search algorithms in the context of language compilers and efficient data structures for graphics. I have found that mathematics students are also enthusiastic to see applications. When teaching design theory to graduate students, I gave them examples of the connection between designs and cryptography, error correcting codes, and algorithm de-randomization. This was very popular and the students reported that seeing the applications made the pure mathematics easier to learn and solidified their knowledge. Combinatorics offers a wide range of diverse applications and I am glad that I have chosen a research area that is also fruitful for educating. Recreational examples can also be fun. I had great success teaching group theory in the context of the Rubik's Cube and similar puzzles.

Both in Vancouver and Toronto, I have participated in liaison with high school students and teachers, participating in the University of Toronto's SIMMER and SOAR programs, the Peel School Districts Gifted summer camp and SFU/PIMS Evenings of Mathematics. These events stimulate student's and teacher's interest in mathematics, and show them how the math they learn is related to current research and has been applied in technology that they use every day. Teaching and designing courses in graph theory, computer science and geometry has also been rewarding for curricular experience and the interaction with talented students. I discussed my research with these students and gave them an interest and insight into mathematics and computer science beyond the classroom. I found interaction with gifted students especially rewarding when the student has been able to see beyond the class material and question the assumptions or definitions that I or other professors have made.

However, I have been struck more by the importance, beyond focusing on gifted and talented students, to devoting time and energy into making the curriculum accessible for all students. Students who are not doing well in a class, who are intimidated by the subject itself, or only taking the class because it fulfills a requirement, are often reluctant to ask questions in class and do not come to office hours, failing to gain the knowledge made available to them. I try hard to make myself available to these students. I find that non-aggressively engaging these students during class can reduce their reluctance to ask questions. In one case I created extra office hours for the individual doing most poorly in the class. He had failed the year before, but after many months of one on one work he and I were able to bridge the gap in his understanding, and he was able to pass and graduate.

In a related note, I developed computer labs for the classes I taught. I think that the integration of technology into the classroom is crucial and becoming ever more so. Computers offer the potential to access mathematics in novel and highly visual ways. In my experience, the computer labs allowed students who were having difficulty grasping the subject matter to visualize the concepts while giving the gifted students the opportunity to explore. I have found that tactile demonstrations are sometimes as potent as visual and technological methods. I often use shapes and objects that the students can touch to understand geometrical and algebraic concepts. I think tactile learning is under-utilized and deserves more attention.

I find when teaching classes, that how I carry myself and how I relate to the students who are more shy can have a profound impact on their ability to learn: encouragement rather than ridicule, acknowledgment of the problem rather than denial. This attitude and the energy spent on ensuring that the syllabus is tailored to the subject, the mathematics is taught in context and with examples and applications, can impact profoundly on how much the students learn and how rewarding, both emotionally and academically, the educational experience is for them.