Teaching Philosophy

One of the reasons I chose an academic career was to pursue my interests in both teaching and research. I feel that I have an obligation to educate the next generation of mathematicians. I am very enthusiastic about executing this obligation, and I take great pleasure in watching students become confident in their understanding of the material. To this end, I aim to demonstrate my enthusiasm for mathematics and thus generate interest, excitement and discussion within the classroom.

I create an environment in which students feel comfortable questioning any material presented, both in class and in office hours. This not only helps them gain a deeper understanding of the subject, but also allows me to assess how I present and explain material. Students who are actively participating within the lecture are more likely to retain and understand the concepts being discussed. I embolden students to become proactive in their own education and take ownership of the learning process. I actively encourage students to talk to each other in and out of class. I try to take visual clues, via eye-contact and other non-verbal means, to see if I have lost people, or if I am going too slow or too fast. I also strongly believe that a lecturer should be available outside of lectures. By getting to know the students I can find out how well they understand the material and if I am lecturing at a reasonable pace. Student comments such as "He engages students in lecture and puts in extra effort to meet with students who are struggling or would like extra help" encourage me that I am succeeding in my efforts.

Presentation of course material (and myself) is fundamental to an enjoyable and stimulating classroom environment. I am always punctual, and expect the same from all students; I am well prepared for each class, which demonstrates my respect for the students. I always tell the class that "there are no stupid questions". I add to this that if they think they have a stupid question, it means that I may have not fully explained an idea. I am well organised for my lectures: I always have a clear set of objectives and many worked examples to go through. However, I am always flexible within this structure. There is no point sticking rigidly to a lecture plan, only to have to go through it again if half the class have not grasped the concepts. At evaluation time, I consistently receive comments such as, "He always explained the material very clearly and made sure we understood the lecture before moving on." This flexibility allows me, and the students, to go into more depth on specific issues to glean a deeper understanding. At the start of each class, I give a recap on the recent material covered and ask if there are any questions (either regarding class material or homework). When presenting new material, I first explain the overall idea in logical blocks. This demonstrates to students that, although mathematical concepts can sometimes seem very complex, it can be straightforward to breakdown difficult ideas into smaller, more understandable ones. Using this method when presenting proofs is especially helpful. Students are encouraged to divide the problem into important statements before the whole proof is shown. Also, appropriately chosen counter-examples can be powerful for enhancing students' understanding.

Although mathematics has long been seen as a "chalk and talk" type of course, I find that technology can greatly help one's understanding. This can take the form of computer based projects for a numerical course or experimental demonstrations for a dynamical systems course, like "Pendulum Man". At the University of Michigan, I have taught Calculus I (Math 115), Multivariable Calculus (Math 215), Differential Equations (Math 216), Linear Algebra (Math 217), Numerical Methods (Math 371 and Math 471) and Mathematical Modeling (Math 462). In Multivariable Calculus, Numerical Methods and Mathematical

Modelling, one of the requirements is for students to become familiar with a computational mathematics package (Maple and Matlab). In these courses, I first lecture on the theoretical material. Then, I provide an introduction to the appropriate application. Finally, I encourage group/self exploration of the package. While Linear Algebra at Michigan is a proof based course, when I describe how certain systems of equations can be solved, I explain how these packages can sometimes drastically reduce the time to find a solution. As the semester progresses, I put links on my course website which lead to pages demonstrating how Matlab (or Maple) can be used to visualise or solve problems. During my Ph.D. I was lucky enough to teach a variety of courses, namely: Mathematical Techniques for First Year Engineers; Numerical Methods for Second Year Engineers; and Computer Algebra for First Year Mathematicians. Teaching engineers highlighted how useful inter-disciplinary examples can be: "He applied what we were learning about to real life situations, and made everything very clear, and fun!". I have taken that message and used it in all the courses I have taught since. I have used examples from physics, engineering, politics and biology, and I am always on the look-out for others. Although I did not have the opportunity to teach while I was at the University of Nottingham, I was proactive and enrolled myself in a Teaching Students with Disabilities course. This was enlightening, and raised more questions than answers. I have a much wider understanding of the range of disabilities on a university campus and I constantly try to educate myself in how to best create a fully inclusive learning experience.

At Michigan, I have also mentored students outside the classroom. I have been lucky enough to have had four undergraduate students do an independent (research) study under my supervision. This has been a fantastic experience and very eye opening. I try to give the students a free reign to chose a topic and use me as a resource. Watching them get excited by the work and then infuriated when they get confused has been wonderful, both as a mentor and an educator. As an educator I have seen how this type of supervision can be like classroom teaching (as I demonstrate techniques that they have not been exposed to) and completely different (when I have to admit that I do not know what the solution will be, if there is one). Additionally, I am very interested in curriculum development all levels: either developing a new course or a new degree program. I developed the syllabus for the Numerical Methods and Mathematical Modeling courses I taught at Michigan. I found this interesting because there was so much material I was excited about, but only a certain amount time to present it. In the end I decided on a survey course that covered essential topics and hand picked material from a range of material that I felt highlighted the most important topics. I have coordinated two multi-sectional courses at Michigan: Math 115 (1800 students and $\sim$50 instructors) and Math 216 (600 students, 4 instructors and 5 GSIs). These have been great experiences in the administration and execution of large scale courses where collaboration with peers and full professors is required.

Beyond the traditional teaching duties, I always make time to work outside the classroom. The University of Michigan has a history of working with the local community and has an outreach program that invites local school children into the university for three weeks. The children get to pick a variety of mini-courses to attend which range (in mathematics) from infinity to mathematical biology. I always offer to teach a session. Also, children come into the university to tour different departments and spend time with professors. This is great fun: you have a school teacher, a dozen or so high school students and 30 minutes to get everyone excited about some aspect of mathematics. Additionally, I volunteer yearly as a Science Fair judge for the local Middle School (11-13yrs). Each year I am reminded how much enthusiasm can be generated by just demonstrating how much you love the subject. Perhaps my favorite student evaluation comment of all: "I learned a lot and enjoyed it so much to switch to a math major [sic]".

This leads to my main philosophy when teaching: get everyone excited about mathematics.

The University of Michigan
School of Education
Teacher Education Office

STUDENT TEACHER PERSONAL STATEMENT

Briefly describe a significant learning experience on your path to becoming a teacher. Address how this experience has impacted what you believe about teaching and learning and how it has influenced the type of teacher you hope to become. (Ideas to think about: What is important about the particular experience you describe? What insight(s) has it provided you? What puzzles, troubles, intrigues you about the experience?)

Even in the earliest of my school years, mathematics always stood tall as my favorite subject. Looking back, the reason for this was quite simple – I almost always excelled in this area. When I decided to pursue a career in education at the University of Michigan, I couldn't help but think of the countless students I'd heard through the years that labeled math as their most boring and difficult subject. It was at this point that I realized my calling; I'd attempt to change the preeminent attitudes of today's collective youth by dedicating myself to becoming the very best teacher I could one day be.

As I began my first courses at the University, I was excited to learn under some excellent instructors that could potentially add fuel to my fire. However, as I embarked upon the sequential Calculus courses that serve as prerequisites for upper-level classes, I became disappointed on a number of levels. As is typically the case, there were initial struggles to adjust to the tempo and severity of the work load in these classes. Still, on top of this, I grew frustrated with studying under graduate student instructors that lacked the passion and teaching sense of the more experienced professors I had expected. The turmoil swirling through my mind led me to reflect upon my prospective career path. Although I was intrigued by how the material learned in these courses applied to real world problems, I realized that it had been quite some time since I'd truly appreciated learning mathematics. As I approached my upper-level classes, I became fascinated with the connection between enjoying the subject matter and having a good teacher.

It was at this time that my fate took a turn for the better – I enrolled in a Linear Algebra course under the tutelage of Professor David Gammack, a twenty-something British teacher who had a great personality that he used to our benefit. I vividly recall walking into his office hours after the first week of class and sharing my concerns with him: while I wouldn't be the smartest student he'd instruct at the University, he'd never teach a more dedicated student than me. To my adoration, he told me that there would be nothing to worry about if I applied myself as much I had promised.

Professor Gammack was my first college math teacher who went out of his way to ensure that *all* of his students had equal opportunity to learn the material. In my opinion, it has become increasingly routine for teachers to place too much emphasis on the shining performances of their smartest students. Consequently, these same instructors often neglect to acknowledge the modest accomplishments of other

pupils. This was never the case in Linear Algebra, as a friendly classroom environment was established where students could raise concerns and ask questions without hesitation or fear of judgment. Whenever my colleagues or I fell behind in any way, Professor Gammack would politely ask that we stay after class for a few moments to discuss our areas of trouble. It seemed that the door to his office was always open to students in need of help. In short, I not only rediscovered a passion for educating myself in mathematics but also learned more in this course than I ever had in any of my past classes. From acquired knowledge to actual grades, I was delighted that the *best* students were identified as such based only to some degree upon preset intelligence, but also, and perhaps more significantly, upon work ethic and dedication. Ultimately, these students obtained the most out of the course, and, likely working in direct correlation to our instructor's solid teaching methods, the majority of the class expressed much gratitude toward both the learned material and the professor himself. When grades were emailed shortly after our final exam and I discovered that I'd earned my first solid A in a mathematics course here at the University, I was filled with a sense of satisfaction unlike any I had ever felt. In what could be viewed as symbolic of the ethics Professor Gammack instilled within me throughout the semester, he concluded the message with the note, "You earned it."

While I did take joy in my achievement, I realized then that much of my success was to be owed to my teacher. It was this newfound spirit that led to eventual success in my curriculum over the past year. Some of the most valuable lessons I've learned through my studies were birthed during my time as a pupil of Professor Gammack. I cannot begin to count how many times I've heard the common frustration: many students spend more time studying for their math classes than for any other subject yet still earn the worst of their grades in these very courses. While such things are typically easier said than done, I've grown very enthused with the prospects of motivating future high school classes in ways similar to those which inspired me in Linear Algebra.

Perhaps if we as teachers could encourage more positive attitudes, students wouldn't spend as much time worrying about their best efforts being good enough and rather feel more confident in their abilities. From my own experiences, I've learned that establishing and maintaining an optimistic outlook can play a crucial role in determining eventual success. While it may be true that mathematics is far from a favorite subject for many young students, this does not mean that we should neglect challenging them in this area. Without denying the difficulties of this subject, mathematics can be looked wonderfully upon by the masses when seen from a more open and inviting point of view.

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Student Signature Date