

Statement of Teaching Philosophy

My teaching begins in 2003 when I was given a chance to lecture for the Early Admission Scheme students on pre-calculus during the summer training program in HKUST. Since then I have taught mathematics for 6 years as a graduate student at Yale University. I was a lecturer for both single and multivariable calculus courses, as well as a teaching assistant holding tutorial sessions for an advanced linear algebra course. My teaching experience is not limited to undergraduates. Even as a project researcher in Kavli IPMU, Japan, I have given several short lectures to Ph.D. students in various summer schools on representation theory. Although my current Assistant Professor position in Kyoto University is research based (as teaching is mostly done in Japanese), I am very happy to be assigned as course lecturers (in English) on Linear Algebra, as well as Advanced Algebra and Honor Mathematics for the Japanese and international students in the coming academic year to resume my teaching career.

I strongly believe that anyone can understand college level mathematics given proper learning opportunities, and as a teacher it is my job to engage the students in the process of learning, and successfully convey my knowledge to them. Below I will focus on my experiences as a calculus teacher during my years at Yale University.

Teaching style. My teaching style has been very rewarding. The teaching evaluations from the students over the years at Yale University have been very positive, with most students praising my ability to explain concepts in a clear and motivational way. The grades of my sections are usually above average comparing to other sections of the same calculus course.

The syllabus for calculus is usually structured to teach one or two new topics in each lecture. To get my students motivated, I start every lecture with a review of the materials of the previous lectures, and explain their connections to the new topic. Since most of the students in my class are non-math majors, before writing down the definitions and the theorems, I first give very simple examples to illustrate the idea of the theory, and discuss their properties in common with the students. This helps the students a lot to understand the abstract theory later on, where they will have easy examples to keep in mind. I then go on to do more examples, gradually from the very trivial to those that require substantial thinking, usually comparable to the hardest questions that will appear in the examinations. This teaching style is greatly inspired by the best *Abstract Algebra* textbook by Dummit & Foote, which always keep track of simple working examples as the theory progresses.

If students get lost at one point during a mathematics course, it is normally very hard for them to follow the materials afterwards. Therefore it is important to make sure everyone is paying attention and grasps the concepts. Here I will explain the same material at least twice, and moreover, I pause once in a while to let confused students ask questions. I particularly enjoy answering creative questions raised by students as they encounter new materials. It is also crucial for me to write slowly and clearly so that students taking notes can follow, one of the essential teaching aspects that I valued when I was a student. Furthermore, I use color chalks very often, both in drawing graphs and doing numerical calculations to make the explanations clearer.

Use of technology. To explain important concepts as well as making the lecture fun, I prefer the use of technology in teaching, especially in multivariable calculus where visualization of three dimensional objects is extremely important. Mathematica has become an important part of my teaching. Whenever I setup my laptop before the lecture, the excitement of my students is priceless. With my up-to-date expertise in Mathematica programming (current version 11), I am able to present not just simple graphic objects, but also complicated controls that help visualizing the 3D graphics. These include, for example, the visualization of intersections of surfaces by transparencies and color changes (Figure 1), and animating the dependence of parameters using the `Manipulate[]` function. I also created new graphs not available elsewhere to illustrate the idea of parametric surfaces, while at the same time amaze the students, such as plotting a pumpkin during Halloween (Figure 2), in the hope that they will enjoy the course even more and appreciate the use of the graphical software. Finally I rewrote the calculus course webpage hosted by Prof. M. Frame using the latest version of Mathematica (as of 2012), renovating it with new graphics, introducing new features and commands, and writing up step-by-step guides of the software.

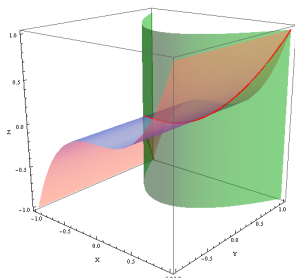


Figure 1: Visualizing intersection

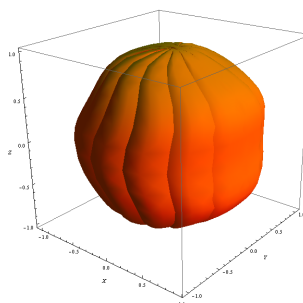


Figure 2: Pumpkin

Outside classroom. My teaching enthusiasm is not limited to the classroom. I carefully prepare teaching notes by working out examples from textbooks, and also look for suitable examples online that are fun and illustrate the idea of the theory better. If computer software is not available, I will sketch any graphics needed beforehand and recreate them with color chalks in class. I will look through the weekly homeworks and summarize common mistakes the students have committed and discuss them in class. I have prepared summary notes for both midterms and final examinations for students, illustrating in point form the important formulas to help them study for the course. I was proud to be told that my notes are popular at Yale and are widely used by students from other sections in the past few years. I also prepare online quizzes through the Yale classesv2 server, and collect questions from the students by email before the exams so that I can explain the topics that are still unclear to the students, write up FAQ notes which answer all the collected questions, as well as answering them in the review sessions. During office hours, I am also able to aid students until they understand the materials thoroughly.

Massive Open Online Course. Finally, I have participated in various Massive Open Online Course (MOOC) as both student and course moderator. From January to February, 2016, a four week online course *Fun with Prime Numbers: The Mysterious World of Mathematics* is being held on the online course platform www.edX.org given by Prof. Tetsushi Ito from Kyoto University. There are more than 6000 students registered for the course. As a course advisor and moderator, I helped out preparing the setup of the course, as well as interacting (in English) with international students in the course forum, answering questions in the discussion, and giving feedbacks of the course materials for improvements. The course ended on February 21, 2016 with many positive feedbacks given in the Ending Survey. Furthermore, by participating in various other lessons, I have learnt a lot of different teaching techniques from all over the world, especially on the latest technology for presenting ideas. I believe that my experiences gained from MOOC will certainly be an additional benefit to my teaching skills.

I love teaching and interacting with my students. I was once flattered to learn that my students in my linear algebra tutorial session had set up a fans group for me on Facebook. I really enjoy it when I successfully convey my knowledge to my students, and would definitely love to continue my teaching career and improve my teaching skills in the future.