

Department of Mathematics - University of California - Santa Barbara, CA 93106  
cote@math.ucsb.edu | math.ucsb.edu/~cote

My desire to teach undergraduate mathematics has directed the path of my adult life. The joy and challenge of teaching is guiding a class through a complicated narrative; navigating a course which will not only arrive at some destination, but also allow us to appreciate the journey and sightsee along the way.

In all mathematics courses I teach, my goals for all students are the same: to understand mathematics as both an evolving science and a beautiful art: to see math as not only a topic they can learn and excel at, but also one they want to.

## MY TEACHING STYLE

*"More important than the curriculum is the question of the methods of teaching and the spirit in which the teaching is given."*

- Bertrand Russell

### DYNAMIC CLASSROOM AND ENGAGING DELIVERY

My classroom draws from different styles; I lecture, design group activities, call pairs of students to the board to present their findings, and use a variety of methods to gauge class progress and adjust the course as necessary. Engaging various learning styles, I strive for an inclusive and exciting classroom.

Since each meeting has a different topic and learning outcome, the presentation is different. We may watch a short video pertaining to a "real world" problem which the day's material relates to. If the topic is the first fundamental theorem of calculus, a small group project about an accumulation function leads the class to discover the theorem and see why it holds true.

An important activity, presented in classes where it pertains, is to have the class solve one case of a problem which has further cases where the answer is unknown. Experiencing the excitement of the unknown shows students that mathematics is alive and growing. Admitting we don't have all the answers removes the stigma from asking questions.

### KEEPING THE MATERIAL INTERESTING AND RELATABLE

*"He is clearly passionate about math, and his excitement carried over into our classroom."*

- Student evaluation

To further display math as a human endeavor, lectures are punctuated with historical tidbits, mathematical folklore, and hints of what lies ahead (or beneath) the topic at hand.

If we are discussing real valued functions, I will mention the complex numbers (which most students have seen), and also the quaternions (along with the famous story of Hamilton's graffiti). When discussing Riemann integration, I make sure to point out a non-Riemann integrable function, which often leads to a quick few words about rationals, irrationals, and sizes of infinity. In a class where we show  $\sqrt{2}$  is irrational, I warn students about math cults with the story of the Pythagoreans drowning Hippasus.

### USE OF TECHNOLOGY

One effective technology I used with a course is a class “wiki”, a collaborative student-built website with a structure like Wikipedia. Instead of asking students to participate in a forum, students collaborate with their classmates throughout the course to build a wiki, which ends up being sort of a non-linear book of the course material, with definitions, theorems, worked examples, and various extensions. The beauty of this is students gain ownership of the course material as they explain ideas in their own words and add applications of personal interest.

### MIXING INQUIRY AND LECTURE AS AN INSTRUCTOR

---

*“Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other.”*

- Paulo Freire

Robust lectures, group investigations, and student presentations are all critical components of the courses I have taught. The ideal concentrations of each is a function of the course topics, student-teacher ratio, classroom constraints, etc.

### MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS

*“The course was really challenging for me but truly eye-opening to how exciting math can be when it’s taught well.”*

- Student evaluation

For three summers I was a part of a course called Mathematics for Elementary School Teachers, first as a Teaching Assistant and then as the Instructor of Record. The learning outcomes were much different from a standard college mathematics courses.

The bulk of the course was group work, much of which had a low enough point of entry and interesting enough potential learning outcomes that it not only engaged the graduate students in the course, but would also be useful in their future elementary classrooms.

Working with pre-service schoolteachers was particularly rewarding. Nearly all entered the class with the impression that they were not “math people”. Just hours later my students were discovering patterns, making conjectures, and finding out they were not only able to do mathematics, but even were also capable of enjoying it.

### INTRODUCTION TO HIGHER MATHEMATICS AND PROOFS

*“He doesn’t just answer your questions but he gets you to think about them until you can answer it yourself.”*

- Student evaluation

Designing a first proofs course is challenging due to the span of options available. One must balance depth and breadth of material while also finding an appropriate level of rigor. I took the approach of emphasizing mathematical communication, asking students from day one to write full sentences and explain their ideas to each other, first in small groups, and then in pairs in front of the class.

## VIEWS ON LEARNING AND GOALS AS A TEACHER

---

*"He is very skilled at asking the right questions to push our thinking to the next level without revealing the answers, and he's extremely patient. My attitude towards math was really changed through this class."*

- Student evaluation

### KNOWLEDGE IS A LIVING SOCIAL COMMODITY

Knowledge does not exist in a vacuum; knowledge is communal, and interaction is the catalyst for creation of knowledge. In course design, I emphasize the social nature of mathematics, building a community of learners where everyone, including myself, is not only sharing their understanding, but also respecting the understanding of others.

### MINDSET IS IMPORTANT, ESPECIALLY IN MATH

*"He really helped math come alive for me again and that was a tall order."*

- Student evaluation

Many times, I will be teaching the last mathematics course a student will ever take. If past experience and messages have tainted the relationship he or she has with math, this might be the last chance to change their mindset. I know my impact might not only affect the attitudes of my students, but also influence the messages they deliver to their children and, if they become teachers, their students.

### EDUCATION IS A CIVIL RIGHTS ISSUE

*"He was empathetic and helping for my needs in terms of the class."*

- Student evaluation

When interacting with students, respect of different personalities, backgrounds, and challenges is paramount. Conscious of the responsibility that comes as a perceived authority figure, I actively promote equity in the classroom and provide extra resources for students in need.

Seeking out opportunities to assist students with diverse backgrounds, I have worked with the UCSB STEEM program, where I served as a graduate student mentor for students who transferred from community college. I enjoyed building a relationship with these students over the years, providing help with classes and advice when applying to graduate school.

I have also been involved with the Math Circle at UCSB, guiding middle schoolers through some beginning combinatorics and mathematical games. Past students have invited me into their elementary and middle school classrooms, where I talked about a range of topics including symmetric shapes, infinity and calculus. Throughout my career, mathematics outreach will continue to be a way I connect with my community.

## IN CONCLUSION

---

*"This was the first course that challenged me just as much as it enticed me, and I believe that is all because of Ben's style. He wanted us to become more of a math fan by the end of the course. His goal was to increase our interest in math."* - Student evaluation

The inspiration for my desire to teach was the first math course I took in college, a six student seminar on topology taught using the "Moore method", an intense style which involves individual presentations of proofs at a chalkboard. I was enthralled. My desire as an educator is to bring out that same excitement in my students.

Mathematics is about recognizing patterns, applying logic to understand those patterns, and then communicating your findings with others. I strive to engage students with this entire process. In both mathematics and teaching, the more I learn the more I discover there is to learn. Continuing development as a teacher and learner will be the focus of my career.