

## Teaching Statement

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When I first became a Teaching Assistant, I found myself hoping at the beginning of each semester for “good students”. It is a joy to teach when students are interested, motivated, and able. However, a presumption when hoping not to have “bad students” is that it is predetermined. As I have grown as an educator, I have realized that one of my priorities in the classroom is to *cultivate* motivation and scholarship habits in my students that will, for lack of a better term, force them to succeed. An optimal student is one who is interested in the topic, is motivated to do the work required to learn, becomes proficient in mechanical skills of the course, has the intuition and logical ability to solve harder problems, and, not least important, can convey a solution to a problem with adequate writing skills. While teaching, I take *active steps* to encourage *all* of these skills and behaviors in my students. I have taught at four different institutions, including being the instructor of record at three of them. I have teaching experience at a variety of levels of mathematics, from college algebra at San Diego Mesa Community College to combinatorics, statistics, and real analysis for math majors at University of California, San Diego. Additionally, I have experience supervising undergraduate research. In this statement, I will describe my teaching philosophy to this point. However, I am constantly striving to improve as an educator, and I incorporate improvements to my teaching in every new course.

**Experience supervising undergraduate research:** During the Spring quarter of 2015, I participated in the Graduate-Undergraduate Learning Program, run by the math department at UC San Diego. In this program, graduate students are paired with undergraduates who are interested in doing research. With my officemate, I mentored 4 undergraduate students on a problem in finite geometry. Specifically, we studied caps in  $AG(n, 3)$  and its relationship to the card game SET. We held weekly meetings and, at the end of the quarter, the undergraduates gave a Beamer presentation on what they had accomplished during the program.

I feel lucky that combinatorics lends itself more easily than other areas to undergraduate research. Many of the questions are easy to understand for a lay person, and many of the techniques can be understood by a first or second year math major. I hope to have more collaboration with undergraduates in the future, and several topics in my own research are suitable to work on with a talented undergraduate.

**Learning Outcomes:** While I am teaching a course, I have three main goals that I hope to accomplish with students. First, I hope to teach them the basic skills necessary for the course. For example, if teaching calculus, I want the students to know the basic rules of differentiation or integration. Second, once students are comfortable with the building blocks of the course, they should be able to use them to solve harder problems that may require multiple steps or logical deduction. Finally, once the students are able to solve difficult problems, they need to have adequate writing skills to convey their solutions.

I generally use homework to make sure my students have the basic tools required for the course. While teaching Calculus I at the University of San Diego, after the first couple of weeks I was worried that my students were not spending enough time on their homework. At this point, I started giving quick quizzes in class that tested basic skills like applying the chain rule. I found a marked increase in students’ skills. Further, students seemed happy to do their homework, as there was a “reward” of a good quiz grade. This summer, I made a YouTube channel for my Calculus II students at UC San Diego, where I posted videos highlighting how to do common integration techniques. My students gave feedback that these videos helped them to study, and I plan to continue this practice in future courses.

To teach students to solve harder problems, I solve difficult questions in class. I pose a problem, and ask the students what one would need to do to solve it, teaching them to think critically before simply applying a formula. Then I ask leading questions and take suggestions on what to do, so that we solve the problem as a class. I also assign harder homework problems, and let the class know specifically that they are important problems and that they should expect questions of similar difficulty on an exam. Further, I believe that it is important to incorporate basic proofs as early as precalculus. These should be proofs that do not take many steps. For example, in a precalculus course I might ask, “Let  $f(x)$  be an odd function. Prove that  $f(0) = 0$ .” This teaches students to make logical deductions and to think about what they need to do to solve a problem before starting.

Once a problem is solved, a student needs to be able to tell me their solution with some level of mathematical maturity. This is a skill that I was not cognizant of until teaching at the University of San Diego, where the math department made it a mission that all of their students would have good writing skills. Now I realize how important, but often neglected, writing is with calculus and precalculus students. To teach this skill, I write clear solutions in lecture and throughout writing I explain what I am doing and highlight the writing process. In addition, I assign homework and test questions where I tell the students that I will grade half of the problem on their presentation of the solution. Showing basic proofs in lecture also gives the students exposure to good writing practice.

**Motivation and interest:** Students are motivated for a variety of reasons: grades, applications to other subjects, a personal connection with faculty or peers, seeing beautiful mathematics, and more. I try to cater to all of these in order to catch the interest of as wide a group of students as possible.

Right or not, the largest source of motivation for students is due to the grade they will receive at the end of the course. At the beginning and several times throughout each course, I remind students that they will do well if they keep up with their homework and studying. In every syllabus I make, I include some form of the following:

*Calculus can be very frustrating if you are lost and confused, but very exciting and fun if you are on top of things. I promise that you will enjoy this class more if you are doing well!*

Further, I try to have a part of the course where students know they can receive full credit if only they put in enough work. One example of this is to give 5-minute quizzes at the beginning of some classes where I give a problem verbatim from the homework. I find that many students are eager to do homework when they are sure that they will find the quizzes easy. Thus, I tend to use this type of work to make sure students know basic mechanical skills for the course (e.g. in a calculus course, I may have a quiz that asks to take the derivative of the product of two basic functions. A student will find this type of question easy if and only if they have done the homework for the product rule).

Other students are motivated by application to other subjects. Throughout a course I try to explain where certain techniques can be applied in other sciences. I ask my students at the beginning of every course what their majors are so that I can tailor my examples to the specific group of students that I have.

Approval by peers and faculty motivates others. I seek student participation throughout *every* lecture, asking guiding questions while they lead me through a proof or solution to a problem. I tell them from the first lecture that I expect participation and that my questions are not rhetorical. I give praise when students speak up, engendering a culture where students want to participate

and want to supply the correct information. This engages students with the lecture and gives them another reason to do their best to understand the material.

Finally, when I see an elegant explanation or solution (usually from a student!), I share with the class my enthusiasm for what I see. My hope is that I can convey my excitement for mathematics to my students. Once a student is excited about the subject, it is easy to get him or her motivated to learn.

**Data from past teaching:** Below I provide an overview of my teaching experience, as well as selected quotes from students. A complete set of student evaluations may be found on my website at <http://www.math.ucsd.edu/~mtait/Teaching.html>

**Experience as the Instructor of Record:** I have had the opportunity to be the Instructor of Record at three institutions for three distinct courses.

Year	Institution	Course	# of students
Spring 2012	San Diego Mesa Community College	College Algebra	37
Fall 2012	University of San Diego	Calculus I	21
Summer 2015	UC San Diego	Calculus II	50

- “Fantastic professor with a great sense of humor. Very relatable because of his young age, and able to give relevant examples to his students. Always asks questions and expects class to participate, but not in a rude way.”
- “He is a young professor full of talent and positive energy. He definitely cares about his students. I am very happy that I had the opportunity to be taking math 10B with him. Definitely recommended.”
- “I thought that he was very clear and interactive. I appreciated his in class props and his many attempts to draw accurate pictures; I would consider myself a very visual learner and it was very helpful to see those things during class.”
- “Michael Tait is an excellent instructor. It is clear that he knows the material well and his enthusiasm for calculus is palpable. He is very accessible outside of class during office hours. He even created a YouTube channel for MATH 10B. One of his best qualities is that he is very patient and he always listens to students’ questions. He will even go over problems again if you don’t understand them. Excellent overall. Highly recommended.”
- “Pretty awesome teacher. Haven’t taken calc in three years, and took his class. Really good at teaching, and giving confidence to his students that dislike math.”  
–Calculus II, Summer 2015 at UC San Diego
- “Overall, very knowledgeable! Great help during office hours as well & interested in students success.”
- “Mr. Tait is a great teacher, makes the class entertaining and fun. Personally, I feel there should be a few more actual example problems and a few less proofs, but the course and instructor are good =).”  
–Calculus 1, Fall 2012 at University of San Diego

**Experience as a Teaching Assistant:** My experience as a Teaching Assistant has been fairly standard. The duties that I was tasked with include leading recitation section, holding office hours,

and creating/grading exams and homework. In 2011 while teaching second semester calculus, I led a weekly Maple lab.

Year	Institution	Course	Approximate # of students
Fall 2010	University of Delaware	Calculus I	80
Spring 2011	University of Delaware	Calculus II	70
Fall 2011	UC San Diego	Calculus I	61
Winter 2012	UC San Diego	Calculus III	70
Summer 2012	UC San Diego	Real Analysis	50
Fall 2012	UC San Diego	Calculus III	150
Winter 2013	UC San Diego	Statistical Methods	25
Summer 2013	UC San Diego	Real Analysis	70
Fall 2013	UC San Diego	Calculus I	155
Fall 2014	UC San Diego	Calculus II	70
Spring 2015	UC San Diego	Combinatorics	85