

Teaching Statement

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1 Teaching Philosophy

I teach based on the principle that practice and context drive robust learning. In practice, I do not use a single teaching style, but draw elements from expeditionary learning, inquiry-based learning, and flipped classrooms, direct instruction, and differentiated instruction. My flexibility allows me to best address the needs of different classrooms and individual students. I implement these methods in the following ways:

1. **Expeditionary learning** is implemented in the form of student presentations, typically with more experienced undergraduates, in classes like linear algebra and differential equations. Students are encouraged to pick from a list of topics or formulate their own topic. For example, my Summer 2016 class was given the list:
 - Write a program to reproduce the bifurcation diagram of the logistic map.
 - Write a program to reproduce the Fourier series of classic functions: square wave, sawtooth. Demonstrate improved accuracy with more Fourier terms.
 - Write a program for Forward Euler, 2nd order Runge-Kutta, and 4th order Runge-Kutta. Compare accuracy .
 - Series solutions of differential equations: discuss several examples of this solution method.
 - The method of Lyapunov. Present the theorem and show examples of the method.
 - Matrix exponentials. Show how to solve linear ODEs using matrix exponentials.

While I provide close guidance in preparing the presentation and research, students are given great independence in exploring the depth and breadth of their topic. This approach includes elements of **personalized teaching**, where students are allowed to master topics at their own pace, and are given additional guidance as needed. My students not only enjoyed this process, but found that it helped them understand detailed and big-picture concepts.

2. **Inquiry-based Learning** is implemented in every lecture by encouraging both myself and my students to ask questions about the work. Why is it important to know derivatives? What is the use of the matrix null space? This process of questioning has led me to become a better teacher by helping students understand why and how some concepts were introduced. For example, based on my students' questions, I felt that my explanation of nullspace was insufficient, learning me to write a Python script demonstrating how matrices deform shapes. The visualization better explained the concepts of nullspace, range, and linear transformations. As another example, also based on my students' questions, I explained how matrix notation took the better part of a mathematician's career to standardize, and the notation is relatively young compared to the millennia-long history of linear equations. Through inquiry-based learning, my students have a voice in how they learn.
3. **Flipped classrooms** are implemented on days dedicated to problem-solving. Near the beginning of the semester, these problems are straightforward applications of formulas, definitions, and theorems, which are crucial for a baseline understanding of advanced concepts. This stage often appears as **direct instruction**. Students are assigned a series of reading sections or problems prior to class, so they are prepared to learn how to solve

problems. As the semester progresses, I introduce increasingly challenging problems that push the students to connect multiple concepts, and perhaps, to generate their own. To assist in problem-solving, I assign students to work in pairs and encourage discussion, which leads to a mutually beneficial give-and-take: as the students encounter difficulties, they often overcome them autonomously while teaching each other in their own words. If they are unable to overcome a hurdle, they ask for help, which makes me understand the specific challenges faced by my students. Through this process I tailor my teaching to adjust to individual students.

4. **Differentiated instruction** is implemented at all times. While my default teaching style is geared towards a broad spectrum of abilities, it is not always the case that students will excel in a classroom environment. In fact, I was a student who struggled in classroom environments despite being able to learn in other contexts. Therefore, I am sensitive to students who struggle and especially those who seek help during office hours. I have found that these one-on-one meetings are excellent for tailoring my teaching to the individual in a way that would not be possible in a lecture. For example, I had a student struggle to understand basic proof concepts while establishing an upper bound using the triangle inequality. Explaining the concepts took substantial time and effort, but the student ultimately excelled in the course. I do not hesitate to help my students in these moments.

To conclude, I remark that my teaching efforts are always **independent of a student's race, gender, or socio-economic background**. I hope to see a world where every student has access to teachers who genuinely want their students learn and succeed, based on the tenets of **diversity, equity, and inclusion**. To this end I have taught as a guest lecturer in science for underrepresented Bangladeshi children at Moder Patshala and the Free Library of Pennsylvania. At Brandeis, I volunteered in science outreach to give neuroscience lectures at Waltham High School (the event was canceled due to COVID-19). In the future, I will continue to seek opportunities in science outreach and join organizations advocating for underrepresented groups, including the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and the Association for Women in Mathematics (AWM). **All people deserve the best from their teachers and I will not stop working to make this hope a reality.**

2 Teaching Experience

<i>Type</i>	<i>Class</i>	<i>Term(s)</i>
Brandeis (2019-2021)		
Lecture	Linear Algebra	Spring 2020
University of Pittsburgh (2013-2018)		
Lecture	Differential Equations (3 sections)	Summers, 2014–2017
	Linear Algebra	Summer 2015
	Discrete Math	Spring 2015
Recitation	Computational Neuroscience	Summers, 2014–2017
	Business Calculus (6 sections)	Fall/Spring 2013/16
	Calculus 1, 2, 3 (6 sections)	Fall/Spring 2014–2016
Grading	Differential Equations (10 sections)	Fall/Spring 2013–2017
	Complex Variables and Applications	Spring 2017
	Linear Algebra (2 sections)	Spring 2016
Oberlin (2013)		
Assistant	Computational Neuroscience	Winter 2013
Case Western Reserve University (2012)		
Assistant	Calculus 3	Spring 2012

My teaching experience spans eight years at three institutions. My teaching style has consistently led to strong teaching evaluations and a shortlist for the Elizabeth Baranger teaching award, which serves to recognize and reward outstanding teaching by graduate students at the University of Pittsburgh.

I independently designed each course and prepared all materials including lectures, quizzes, tests, and homework assignments when serving as a lecturer, where I taught classes of varying sizes, ranging from 9 to 50 students. My teaching duties included meeting students during office hours and making additional appointments as needed. As a course assistant, grader, or recitation leader, I coordinated with the instructor to best evaluate students through quizzes and homework assignments. At the University of Pittsburgh, I became closely acquainted with Lon Capa while teaching numerous courses in the calculus sequence. All recitations were supplemented by office hours and additional appointments as needed.

I prefer to teach an advanced undergraduate class of my own design in mathematical biology or mathematical neuroscience, but otherwise have no preference.