

TEACHING STATEMENT

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INTRODUCTION

I consider teaching an essential part of my growth as a scholar. Being able to communicate abstract ideas effectively to an audience, part of who might not share the same level of enthusiasm for the subject and help them gain an appreciation for it, is a vital part of my role as a mathematician. The 2018-2019 academic year marks my fifth year as an instructor of record for a range of undergraduate Mathematics course at Bowdoin College and at the University of Chicago, during which time I have taught introductory and advanced classes geared towards freshmen, Math and Science majors, and advanced high school students, both with pure and applied/interdisciplinary elements, all with great feedback. Additionally, I have mentored several undergraduate students through independent study sessions, the Directed Reading Program (DRP) and the summer Research Experience for Undergraduates (REU), and trained students for *Mathematical Olympiads* and *Putnam Competition*.

PHILOSOPHY AND GOALS

From the first day of class, I try to make lectures as much engaging and interactive as possible, and make sure that the material is fun and challenging to learn while being accessible at the correct level to my students. I frequently ask questions and take enough pauses to ensure that they get a chance to catch up with hard concepts. My students have praised my enthusiasm, positivity, and willingness to help them both in and outside the classroom, and often commented that my colorful mathematical drawings on the blackboard and physical cues helped them understand difficult materials easily. Two of my U. Chicago students wrote the following comments in their evaluation.

“he is just fantastic at instilling a love for math. I had no intention of majoring in Math at the start of the year, and these 2 amazing quarters completely changed my mind.”

“[he] goes out of his way to explain things, and even beyond his role as an instructor, he cares about his students.”

Inclusive classroom. I am constantly working hard on developing new teaching techniques in order foster an inclusive classroom and effectively help every student coming from diverse backgrounds, both mathematical and cultural. While actively monitoring the classroom dynamics to make sure no one feels isolated, I try to provide equal attention and helpful honest criticisms to both the capable and the less experienced students. To encourage collaboration among them, I often engage them using *Think-Pair-Share* or *Small Group Work* techniques using handouts. For example, in my Differential Calculus class, I divided the student body into (rotating) small groups as each group is assigned a blackboard to work on particular multistep or difficult problems. A part of assignments each week are marked specifically as teamwork to ensure everyone learns from and with their peers. I have also had interested students work on projects to *mathematically model* real-life scenarios relevant to them. For example, in my Integral Calculus class, I asked them predict the ticket availability over time for the ‘summer breeze’ concert at the university using ODEs and calculate the probability for getting their preferred seats; allowing various contingencies such as black-market or loss-of-interest over time. In my Multivariable Calculus class students identified effects of climate change by looking at contour plots of icecap levels; and in Linear Algebra class, they did projects on basics of Machine Learning and various Optimization techniques. Some of the students used words like ‘quest’s and ‘adventure’s to describe these small projects in their feedback.

Commitment to diversity. It is important to me that students are treated as individuals, multiple perspectives and experiences are valued and promoted, and each of them is encouraged to push through challenges and setbacks in order to achieve their goals. Coming from a middle-class family from rural India, I am aware of the problems faced by students with disadvantaged backgrounds as I strive towards being able to provide guidance as a teacher. In this regard, I am fortunate to possess the unique experience of teaching a group of academically talented incoming first-year students at UChicago through the *Chicago Academic*

Achievement Program (CAAP), many of whom were first-generation college students or from low-income communities. Apart from the regular coursework, I also helped them develop social networking skills and explore ways of utilizing campus resources.

I have found that my students have an enormous amount to teach me and I strive to learn from and to adapt both the style and content of my teaching material to reflect the diversity of my students. This has included mundane but important steps like learning to lecture more effectively to non-native English speakers by incorporating technology in lectures (e.g. beamer slides for presentations) to promote *visual learning*, employing various *digital and computational tools* (e.g. Mathematica) to complement the lectures by designing creative, globally conscious, and practical lab work, spending extra times with students with disabilities, as well create *class notes* and *handouts* that are more heterogeneous in nature. My liberal arts teaching experience at Bowdoin College is of particular import, which allowed me to successfully implement new pedagogical strategies such as a partially *flipped classroom* and use Blackboard (previously, Canvas) to maintain an *online community* where they can grow by helping each other. Besides keeping track of their own performance, many of the shy students find their confident voice in the online forums when they realize that others hold similar opinions or that it is entirely acceptable to have differing viewpoints.

Teaching outside the classroom. I firmly believe that the process of teaching is not confined to the classroom and it is important to keep curious minds busy by engaging them in intellectual discourse in their spare times. E.g. in my Linear Algebra course, I encouraged interested public policy students to write computer programs implementing algorithms like Gauss-Jordan elimination and QR decomposition. In an optimization and linear programming course, I worked with some economics majors on game theory projects about prisoner's dilemma and lowest unique bid auctions.

As a Visiting Assistant Professor at Bowdoin College, I got the opportunity to guide an independent study course with a talented Math Major in Spring semester as he found my research interests aligning with his own future grad school expectations. At the University of Chicago, I mentored eight undergraduate students through the *Directed Reading Program (DRP)* and the summer *Research Experience for Undergraduates (REU)* on a wide array of topics from geometry, linear algebra, topology, dynamics of group action etc. We usually met twice a week for about 10 weeks, where the students would discuss a paper they have read and any original work they have done, followed by me outlining the next possible direction of approach and available useful literature. In both cases, I also helped them learn mathematical writing and coached them for an end-of-quarter presentation or written paper.

I have experience in training high school students for *Indian National Mathematical Olympiad* at both regional and national levels, and have worked with *Math Circles of Chicago* as a volunteer TA and once as a judge for their young math symposium, QED. Currently, I am working with several senior students at Bowdoin College in a Problem-Solving Seminar to train them for the *Putnam Competition*. Several times over the last years, I have also given colloquium style talks in lunch seminars, specialized invited talks in student seminars, and in joint faculty seminars in front of my peers. Through these, I have tried to expose the student community to interesting nonstandard mathematical ideas in an effort to destigmatize math education.

Assessment policies. I have always prioritized rewarding academic growth of a student throughout the course over raw examination scores. Although my syllabi are usually geared mainly towards summative assessments with weekly quizzes, midterms and final exams, I incorporate some aspects of formative assessments with regular feedback on assignments and opportunities to make up grades. The students can make up their grades partially by taking follow-up in-person oral quizzes to show that they correctly identified their mistakes in exams and understood the concept afterwards. I encourage my students to attend scientific seminars and write a small report on them, which they can use to replace their lowest assignment/quiz scores. In one of my intro to proof class, students were required to write a project report on their choice of an interesting Math problem and give a presentation to the class at the end of the course. All of these are clearly communicated to the students at the beginning of the course through a sufficiently detailed syllabus. I have often been praised for my fair grading policy despite moderately hard exams.

Self improvement. As a way to improve my teaching and my students' experience, I always strive to create a supporting environment where they feel comfortable to approach me with their queries. I conduct anonymous student evaluations every three-to-five weeks and try to continually improve myself based

on their suggestion. In a complimentary direction, I have attended several teaching seminars at Bowdoin College and participated in a *Teaching Triangle* program where I got an opportunity to gain new insight into teaching and learn new techniques through reciprocal classroom visits with other departments. Additionally I have participated in teaching workshops (organized by *Chicago Center for Teaching*), and improv classes (led by Heather Barnes from *Second City Training center* in Chicago) in order to learn about handling unexpected questions during lecture and ensure more active participation from my audience.

CONCLUSION

I have been and always will be very passionate about teaching. While I believe to have presented an excellent track record of success at varying level of subject material and teaching styles, I continue to learn new techniques and improve my skills to this day. I enjoy working with undergraduate students both in classroom and on extracurricular math activities and look forward to any future endeavors to that end.

LIST OF COURSES TAUGHT

Bowdoin College. Over the past academic year, I have been fortunate to possess a liberal arts teaching experience at Bowdoin College. As a Visiting Assistant Professor, I was responsible for designing my own course curriculum, planning lectures and handouts, designing and grading exams, holding office hours, and assigning individual and team homeworks. I also coordinated and mentored several graders, teaching assistant and study group leaders. The list of courses I have taught are as follows:

1. A semester of *Differential Calculus* to a class of mostly freshmen and sophomores. Teaching students with a range of interests and various levels of technical backgrounds has been an unparalleled learning experience.
2. Two semester of *Multivariable Calculus*. Teaching to Mathematically interested students who are eager to learn new ideas has been very fulfilling.
3. I will be teaching a semester of *Linear Algebra* in Spring 2019.

Chicago Academic Achievement Program. After my PhD, I had the unique experience of teaching an *Introduction to Proof* class to a group of academically talented incoming first-year students at UChicago through the CAAP Summer academy.

University of Chicago. As a graduate student college instructor, I taught independent section of course, usually with 15-30 students each, for an average 3 hours a week, as an instructor of record. In 2014, I also worked as a teaching assistant for a year-long *Honors Calculus* sequence, and later worked as a grader for various graduate courses listed in my CV. I taught:

1. A year-long rigorous one-variable and multi-variable *standard Calculus* sequence (taught thrice) for science, economics and Math majors.
2. A quarter of *Elementary Functions and Calculus* sequence for non-science (mostly History, English, and Theater) majors.
3. An intensive summer course on *Linear algebra* that met for six hours a week for five weeks.
4. A *Mathematical Methods for Social Science* course (taught twice) focused towards vector calculus, optimization theory, and linear programming.