

# TEACHING STATEMENT : HITESH GAKHAR

## INTRODUCTION

I enjoy teaching and communicating mathematics, with a focus on the underlying implicit skill of reasoning. My general teaching strategy is student focused because students in different courses grasp ideas differently even when they are centered around the same theme. Every small success is important to me. Since my teaching debut at Michigan State University (MSU), I have taught a wide range of courses as the instructor of record, including Transitions to Proofs, Differential Equations, Calculus I-III, and Survey of Calculus-I. Over 14 semesters, teaching 22 different sections and mentoring dozens of novice instructors, I have worked hard to develop my teaching practice, which was recognized through the TA Award for Excellence in Teaching in 2019. Moreover, I am currently facilitating the first ever Writing Group in the mathematics department, for which I received a fellowship from the Graduate School.

## TEACHING STRATEGIES AND EXPERIENCE

I begin this section by a description of my teaching strategies and experiences in the different courses that I have taught.

**Transitions to Proofs.** As the instructor of record, I have taught the Transitions to Proofs course in an active learning style. In a usual class, I gave a short lecture covering the basics of a topic which was followed by student groupwork. The idea behind groupwork was to provide them with in-class hands on experience, teach them to collaborate, and build interpersonal communication skills. The groups were divided randomly in the beginning, and more strategically as the semester went on; in particular, according to the comfort levels and preferences of the students. I gathered this information using interpersonal communication and feedback forms, which I expand more on later in the document. Throughout these groupwork sessions, my goal was to help them construct the argument. Although a few students disliked it in the beginning, they agreed that it was beneficial towards the end of the semester. Since most of the students in these classes only had calculus experience where they solved problems based on well-defined algorithms, I often reminded them that mathematics can sometimes be more art than science.

**The world of Calculus.** I have taught Survey of Calculus-I, Calculus I-III, and Differential Equations as the instructor of record. Although the uniform nature of these courses limited instructors' freedom, I focused on breaking the lectures up with time for students to work on problems. In the examples that I presented on the board, my intention was to involve the students as much as possible. Often, I would help the students help me drive the solutions forward. Though most of the small classes I taught had about 25 students, I

“ ... I liked that Hitesh would not just talk at us, he would get the class involved ... ”  
– a Calculus II student, Spring 2019

had the opportunity to teach a week of large lectures ( $\sim 200$  students) for Calculus III in January 2017 while covering for a postdoctoral colleague. In a classroom of proportionate size, audio-visual aspects become more important. While I addressed this by using a document camera and a microphone, there was a trade off in terms of mobility and being able to gauge student reactions. My plan is to involve more technology if presented with an opportunity to teach large lectures. This includes but is not limited to detailed slideshows for rigor, animations for intuition, and mobile applications to help me gauge large scale feedback in real time.

While these courses require different teaching methods and mindsets, there are some underlying themes that are the foundation of my teaching practice.

**Communication and Feedback:** Teaching needs to be adapted to the needs of students. The same strategy doesn't work for everyone. Some students prefer listening, while others like a more hands on approach. These two endpoints create a spectrum of strategies and in my experience, the optimal teaching strategy changes with every batch of students. I use consistent feedback to gauge the atmosphere and adjust my teaching

accordingly, which has a two-fold benefit: conflict resolution, and the creation of a positive class experience for the students, which further leads to a better class dynamic. I use feedback at two levels. The day-to-day feedback is conducted multiple times every class via a simple show of hands. It involves inquiring if they understood the material, and sometimes, asking them to convince me that they do. This allows me to make spontaneous course corrections: for example, if I observe that the topic in hand is causing trouble, I make room for more examples by pushing back the next thing on the agenda. I also conduct a more thorough (yet informal) feedback a few weeks into the semester. This is done via either an open ended Google form, or a paper survey with more directed questions. These surveys aid me in planning ahead and doing things that are helpful to the students. For instance, I designed a survey to gather information about my students' experience with group work, which allowed me to create more productive groups based on their preferences and input. Coincidentally, in that same form, I asked my students about aspects of my substitutes' teaching (while I was traveling to conferences) they enjoyed, which was insightful and interesting. The form can be found on: <https://www.hiteshgakhar.com/teaching>.

**Methodology, Logic, and Beauty:** One of the most important ideas I communicate through my teaching is to prioritize methodology and logic over just the answer. For example, in Calculus II and III, students learn how to evaluate integrals. While most of them know how to algorithmically evaluate the integral using the properties of integration, there is an inclination to overlook the underlying ideas, theorems, and the associated mathematical beauty. This can make the students take things for granted, leading to a weaker understanding of the material. To combat this, I use a two step strategy: first, during my lectures, I often recall theorems and older results while presenting example problems in an attempt to show how connected everything is, and second, while grading I focus more on the ideas than the arithmetic involved.

#### TEACHING LEADERSHIP AND MENTORING

I have held several leadership and mentoring positions in the mathematics department. In 2017, I served as the overall supervisor/coordinator for the courses taught by graduate students in the second half of summer. I have also been a Lead Teaching Assistant for the Mathematics Learning Center and the Center for Instructional Mentoring, where I mentored and supervised both undergraduate and graduate teaching assistants. I performed non-evaluative observations that led to discussions on teaching. In my experience, there is always an overlap in the problems different instructors encounter and discussions aid the solution finding process. In the same spirit, I am also leading and facilitating the inaugural writing group in the mathematics department, in which graduate students work together to improve their writing in mathematics.

#### DIVERSITY

Mathematics, as a discipline, is predominantly male dominated. This discrepancy in gender ratio is also reflected in the undergraduate classes I teach. Such scenarios can be intimidating to female students, and more generally, minorities. My goal has been to create a learning environment where students can express their ideas, even if incorrect, without any hesitation. Being from a different educational system in India, I

"... this teacher did a great job at making us feel confident ..."  
 – a student

strongly believe that teaching and learning mathematics is heavily dependent on culture. This often leads to variation in student exposure to mathematics and educational opportunities. I try to foster an environment where students do not get penalized due to these differences.

#### CONCLUDING REMARKS

In the last five years, I have learned a lot as an educator. I have improved my communication skills, learned the importance of feedback, and have made my classes more inclusive. I plan to keep improving my teaching methods and make my classes more accessible to all students by being involved in the teaching community at my new institution and seeking out feedback from my peers.