

TEACHING STATEMENT

Hitesh Gakhar

I enjoy teaching and communicating mathematics, with a focus on the underlying implicit skill of reasoning. My general teaching strategy is student-focused because different students grasp ideas differently even when they are centered around the same theme. During my time at the University of Oklahoma (OU) and Michigan State University (MSU), I have taught a wide range of courses as the instructor of record, including Linear Algebra, Transitions to Proofs, Differential Equations, the entire sequence of Calculus, and Survey of Calculus-I. At OU, I have served as an advisor to two undergraduate students for the *Honors Research Course*, the outcome of which becomes the Undergraduate Honors Thesis. Over 19 semesters, teaching 30 different sections and mentoring dozens of novice graduate instructors, I have worked hard to develop my teaching practice in all formats: traditional lecture classrooms, active learning classrooms, and flipped classrooms. While my work was recognized through the MSU Mathematics TA Award for Excellence in Teaching in 2019, I plan to keep growing as an educator and continuously evolving my teaching practice to make it more accessible and inclusive.

TEACHING STRATEGIES AND EXPERIENCES

Flipped Classrooms: My first teaching assignment at OU was an online course on multivariable calculus in Fall 2020, at the height of the COVID-19 pandemic. Due to the lengthy class sessions (75 minutes), I was concerned about the attention span of students over Zoom, and hence the efficiency of a regular lecture-style course. This prompted me to switch to a mode that is designed to be more engaging: *Flipped Classrooms*. I made videos for each week that my students were supposed to watch before the class sessions which were geared towards problem-solving and fine-tuning concepts. More specifically, a typical class session would start with taking an unofficial survey on whether the new videos were watched or not, followed by a 5-minute discussion about the new material before we dove into the worksheets. The first problem on a new topic would be solved in an interactive manner on the tablet together with all my students. After a little experience, I would assign a problem, give them time, and then discuss it again keeping everyone involved. In the end, I was very pleasantly surprised at how well it turned out. The students stayed active during discussions, were able to solve the assigned problems, and retained more information than I expected them to. In semesters thereafter, I reused the flipped format for both online and in-person courses in multivariable calculus and linear algebra. I stuck to my basic strategy, making adjustments wherever necessary, and had successful semesters for the students and myself.

“... *The course style, although flipped was actually extremely beneficial to my learning. Viewing the lectures outside of class time and working on problems in class allows for more time to ask questions and really understand the content that is being presented throughout the semester...*”

Active Learning and Structured Groupwork: While my lectures always have had an interaction component, I first used active learning techniques in the Transitions to Proofs course at MSU in 2018. In a usual class, I gave a short lecture covering the basics of a topic which was followed by structured student groupwork. The purpose of 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. 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.

Traditional Lecturing: During my time at MSU, I lectured for Survey of Calculus-I, the entire Calculus sequence, and Differential Equations. To keep things lively, I would break 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 — a strategy that I have stayed with through all my course style and modality changes. It can also be described as helping the students help me drive the solutions forward.

TEACHING BELIEFS

Methodology and Logic: One of the most important ideas I communicate through my teaching is to prioritize methodology and logic over just the answer. For example in Linear Algebra, students learn a variety of different algorithms, most of them reliant on the row-reduction process which they learn in the first week. While most of them know how to successfully solve a problem using a row-reduction based algorithm, 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.

Diversity and Inclusion: 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 every semester is 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 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.

“...I have both a physical and learning disability and I truly believe that Dr. Hitesh has the best course structure for those like me to succeed...”

Accommodation and Access: One very crucial way in which COVID-19 impacted my teaching was that it made me change how I view students and learning. I became a lot more sympathetic to students and their problems. It dawned upon me that life is happening all the time to students as well and more often than not, they are trying their best to survive. Consequently, I became more accommodating with my deadlines, make-ups, and my requirements of documentation needed in these circumstances. I believe that my goal as an educator is to have students master the topic at hand, and if that can be empowered with an extension, I view it as an absolute win. In this spirit, I also make all my materials accessible to my students: *notes, solutions, and pictures of classwork* for anyone who could not make it to class for whatever reason.

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 three levels. The first is a *Welcome Survey* sent out to students in or before the first week of the semester asking them a variety of questions about their expectations and concerns about the course.¹ Next, the *day-to-day feedback* is conducted multiple times in 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 or discussion by pushing back the next thing on the agenda. I also conduct more thorough *Canvas surveys* several times throughout the semester, often for extra credit.²

“...Dr. Hitesh really cares about student feedback and makes decisions based on our feedback that almost always best helped us. ...”

TEACHING LEADERSHIP

I held several leadership and mentoring positions in the mathematics department at MSU. In 2017, I served as the overall supervisor/coordinator for the courses taught by graduate students in the second half of the summer. I was also 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 for several semesters. In my experience, there is always an overlap in the problems different instructors encounter and discussions aid the solution-finding process. At both MSU and OU, I have performed non-evaluative observations that lead to discussions on teaching.

CONCLUDING REMARKS

In the last eight 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. For my professional development, I intend to apply to MAA's Project NExT.

¹The survey can be found on: <https://www.hiteshgakhar.com/teaching>

²I have used Google forms and paper surveys in the past.

RECENT TEACHING EVALUATIONS

In Spring 2022, OU's Teaching Evaluation system *eValuate* was replaced by the *Student Experience Survey*.

In that semester, I taught Linear Algebra and at a 42% response rate (26 out of 62), about:

- 80.7% students felt that I **frequently** explained or demonstrated the larger purpose or value of the material covered in this course.
- 96.2% students **always** felt supported and empowered as they worked to reach the academic goals in this course.
- 96.2% students **always** felt respected, both as an individual student and as a person with their social identities.

Before Spring 2022, OU used the standard teaching evaluation system:

Semester	Course	Response Rate	Extent to which the instructor contributed to your learning*	Instructor's ability to encourage critical and independent thinking	Overall instructor's teaching effectiveness was
Fall 2021	C&AG IV	38/65	4.63	4.68	4.74
Spring 2021	Linear Algebra	33/78	4.64	4.69	4.73
Fall 2020	C&AG IV	49/85	4.33	4.31	4.35

1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent

*1 = Far Below Average, 2 = Below Average, 3 = Average, 4 = Above Average, 5 = Far Above Average

C&AG IV : Calculus and Analytic Geometry IV (Multivariable Calculus)