Teaching Statement

Shukai Du

Overview

The general objective of my teaching philosophy to mathematics is twofold: first, to help students recognize and appreciate the beauty of math, and second, to equip them with the skills to weave mathematical thinking into their study and future professional endeavors.

Mathematics, which Galileo Galilei called "the alphabet of the universe", possesses a unique beauty. Yet, appreciating its beauty often requires the guidance of a skilled teacher and ample practice. At first glance, it might appear as an overwhelming jumble of symbols and notations. This dual nature of mathematics – its intrinsic beauty with its abstraction – poses unique teaching challenges, which I will address in the subsequent discussions.

Build motivation

Capturing students' interest is essential. Without it, even the most effective teaching strategies can fall short. To spark their interest, I often briefly touch on the related history, anecdotes, real-world applications, and the significance of certain theorems – just enough to provide context and promote motivation.

For example, as the instructor for Math 320 - Linear Algebra and Differential Equations:

While discussing matrices and eigenvectors, I highlighted their practical relevance by drawing attention to Google's PageRank algorithm. I emphasized how this algorithm, which underpins one of the world's most utilized search engines, heavily relies on the principles of eigenvalues and eigenvectors.

When introducing numerical methods for ODEs, I underscored their importance by noting that while many ODEs resist analytical solutions, numerical approximations always offer a pathway. By grounding theoretical concepts in tangible applications, I strive to make abstract ideas resonate more deeply with my students.

Students' comments:

"Was very impressed with professors knowledge of material and understanding of the concepts and made it very interesting to learn!"

"Professor Shukai Du is very passionate about the class and goes into great depth on each topic with clear explanation and a very easy to follow class structure that guarantees great performance as long as the student pays attention and follows through on all assignments. Professor Du ws also very helpful outside of class going out of his way to explain the concepts and understandings behind each theorem showed in lecture. His explanations were very thorough and made me, personally, very interested in the concepts taught in this class."

Use examples

When learning math, students can frequently encounter concepts that might seem abstract and elusive. This is why, whenever introducing a new math concept, I emphasize using

ample examples to facilitate understanding. I particularly favor examples that are visually intuitive and/or have ties to physics.

For instance, when teaching the non-commutativity of matrix multiplication, I employ visual aids to foster a more intuitive understanding. I ask students to observe the difference between rotating an image then shifting it, versus shifting it and then rotating it. This hands-on approach helps them understand the unique properties of matrix multiplication versus scalar multiplication.

Students comments:

"Professor Du is one of the best professors I've had the pleasure of learning from at this university. He did an excellent job explaining the content in a way that was clear, simple, and accessible, and provided plenty of examples to illustrate the concepts we were learning."

Active thinking

It's a common human tendency to tune out things they perceive as irrelevant. A one-sided monologue in teaching can make students feel disconnected from the material. Therefore I place a strong emphasis on fostering active thinking.

One method I employ is consistently raising questions to the class, especially the kind of questions that cause mistakes, based on my past observation. This not only keeps them engaged but also helps them in identifying and correcting misconceptions.

Additionally, when time permits, I encourage group discussions. This collaborative approach allows students to learn from each other's perspectives. During these sessions, I walk among the groups, listen and interact, to further facilitate learning and engagement.

Students' comments:

"He really makes sure students understand everything and always asks if anyone has questions."

"Professor Du always comes prepared to lecture and regularly encourages critical thinking and collaborative discussions. He presents the material in a clear and engaging way and always sets aside time to answer students' questions. He is also very accessible in office hours and communicates effectively with the class outside of lecture. The course itself is very well organized and puts a reasonable workload on the students; there are lots of resources provided to the students and the Canvas page is also very accessible."

Being clear and organized

Math is deeply rooted in logic, with its concepts built on one another. A shaky understanding of a math topic, such as linear systems, can impede the comprehension of subsequent topics like matrices and determinants. Therefore, clarity and structured presentation are vital.

For example, at the beginning of each class, I usually provide a brief recap of previous lectures and set the agenda for today's lecture, illustrating the connections between topics. This approach provides students with a roadmap, ensuring they aren't overwhelmed by details.

I also invest time in polishing my teaching notes to ensure clarity. When a theorem is pivotal for various examples, I'll either spotlight it as a sidebar or write it down on the blackboard, to make sure students always have the essential tools at hand when tackling example problems.

Students' comment:

"dr. du was a really good professor. he was really organized and gave us guided notes

to help us learn with good examples. the exams were straight forward and fair, which is hard to come by now. overall, i learned a lot."

Inclusive classroom

Given the diverse backgrounds of students and the constraints of time, finding a teaching pace that fits everyone in the class is a challenge. I am deeply committed to supporting underrepresented students and those who might be struggling. I believe that patience and consistent support are essential to guide them to success.

Students who have a hard time in class may often feel frustrated and lack confidence. They can easily sense any impatience from the teacher, which can diminish their motivation to learn. In my sessions, I consistently encourage my class to ask questions, making it clear that "I expect questions" and that "no question is stupid".

I also consistently remind them of my office hours and encourage them to attend. Office hours offer a valuable opportunity for me to assist students in a more personalized manner, especially for those who are lagging behind. During the office hours, through interactive discussions, I know better my students' challenges so I can tailor my assistance accordingly. For instance, through the several conversations with a student during my office hours, I learned that her main difficulty in keeping up with the course was that she had never learned certain contents that the course assumed the class to know. I therefore helped her review those contents. After several weeks, I observed an obvious improvement in her scores on the quizzes.

Students comment:

"Great instructor. Went to his office hours and he truly cares about his students. Excellent teacher and person."

"Very welcoming and answered all questions asked."

"The instructor is knowledgeable and passionate about the topic, and enjoys helping student who ask."

"Very kind, patient and effective as a teacher."