Teaching Philosophy

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My primary reason for teaching mathematics is a selfish one — I enjoy teaching. I enjoy the thrill of simplifying complex and abstract ideas into smaller parts while also creating an environment where students feel comfortable giving me feedback that lets me shape my teaching to their needs.

The two main pillars and guiding principles in my teaching are — *humanized mathematics* (i.e. reintroducing context, history, and personality into mathematical teaching); and *technology-aided teaching* with an emphasis on "thinking math" rather than "doing math".

Students often view mathematics as a "dry" subject devoid of personal opinions and biases. Often, theorem and proofs are taught lacking human history and context. This makes learning mathematics feel a summit that needs to be climbed instead of a valley that can be explored. Hence I feel that introducing the bigger picture around the math that is taught is the key to students retaining the information longer and relating to ideas beyond just memorizing them for their exams. For example, I put this into practice when telling my students about the gradient, divergence, and curl in multivariate calculus. By introducing these results as mere variants of Stokes' theorem, I was able to link disparate ideas into a single framework. I further showed my students the connections this had with the fundamental theorem of calculus in order to build context around why these results are important and interesting. My students reported feeling a sense of appreciation and intrigue for these concepts at the end of this exercise.

As a teacher, I try to bring trial-and-error center stage in the process of performing mathematics. I believe that having students comfortable with making mistakes, choosing the wrong path when writing a proof, or trying new techniques and tools for completing a problem prepares them for the reality of mathematics outside the classroom. In research as well as industry contexts, math problems tend to be more loosely defined and there aren't always clear paths to the solutions. I try to make my students comfortable with this feeling of not getting the right answer to a mathematical problem in their very first attempt.

I frequently use technology-aided tools for teaching because I have experienced younger students being more receptive to interactive visuals and examples that they themselves can manipulate on a computer. Furthermore, I hope to provide these technological tools to students not just as learning material but also as marketable skills for their professional future. For example, as part of the *Merit Program for Emerging Scholars*, I introduced undergraduate students to LaTeX in my Differential Equations class. I set up a cloud-shared document containing helpful notes and examples from our course and encouraged students to contribute explanations and problems to this collectively-owned file. While initially the students seemed intimidated by the syntax of the software, I encouraged them to give it a try and not worry about making mistakes. I received regular contributions from students and my own role was simply to curate their anonymous edits and check for any errors. The anonymity enabled students to hone their skills at mathematical writing, using accurate notation, and distilling key ideas from any topic. It gave my students experience with using the typesetting software which has become a staple in the sciences and engineering, while also giving them a set of complete notes to refer to as the course progressed.

Another example of technology-aided teaching arose in my design of an undergraduate course on Computational Mathematics. The aim of the course was to teach students to model mathematical ideas in a computer using an open-source software library called SageMath. This was not done to add a layer of complexity, but instead to lighten the

burden of calculations and focus their attention on mathematical structure instead of details. The challenge for me as an instructor and course designer was to balance varying mathematical experiences as well as computational abilities that the students brought with them to the class while not overwhelming them with new programming jargon. I addressed this challenge by designing several "interactive Jupyter notebooks" with a host of examples on which students could model and test out their understanding. The entire course was hosted on a learning management platform called – CoCalc, which included discussion forums as well.

If put on a spectrum, teachnology in my teaching ranges from it being a supplementary tool in the classroom to it being the primary focus in a course. For instance, I used it as a tool when I created GeoGebra worksheets to add interactive visuals to my course on Classical Geometry for high-school students. On the other hand, it was the primary focus in a the Illinois Geometry Lab research project where I taught students computer-aided mathematical theorem proving.

For the purpose of student learning assessments, I use the principles of humanizing mathematics to guage learning not just on procedural mathematics but also on participation and student-run discussions. I grade on effort, not just accuracy and I make sure to clearly communicate this with my students. Sometimes this involves assigning small topics to students in groups of three or four and then having them explain the topic to the class in their own words. I assign points for the simplicity of their explanations or for examples they use, but never for their language and communication skills. This creates an environment of learning and curiosity while keeping the activities accessible for everyone.

I augmented my teaching experience by also mentoring first-time teaching assistants in my department as part of the Merit TA peer mentoring program. I supported mathematics TAs in developing and improving their teaching skills by providing case-study discussions, in-person class observations and discussion of informal midterm feedback from students.

For my work in teaching and mentoring as part of the Merit program for emerging scholars; designing the course on Computational Mathematics that has been inducted in the standard course offerings at the department; and for exemplary teaching in classroom and in discussion sections, I was awarded the *Mathematics Department TA Instructional Award* in 2019. I have also been featured on the UIUC *List of Teachers Ranked as Excellent by their Students* in every semester that I have taught.

Having taught mathematics to high-school, undergraduate and graduate students in varying classroom formats, coming from diverse disciplines like Engineering, Physics and Chemistry, I feel comfortable modeling technical topics to specific levels of student expectations. Teaching is a delicate balance between illuminating the way while also fostering independence, between creating equal opportunities while also letting students engage with concrete instances. For me, it is this balance that is a joy to navigate and it is the feedback from my students that keeps me pushing new boundaries, wanting to forever improve my pedagogical methods.