I am passionate about teaching, and have actively pursued opportunities to teach while at Rice. I am grateful to have had the opportunity to be sole instructor for four courses at Rice, two on differential equations and linear algebra, and two which focused solely on linear algebra. I have found my thoughts on the subject of teaching organize broadly into three categories, which I have indicated below. The accompanying quotes are from Kurt Vonnegut, in his story Bagombo Snuffbox, and are advice for a writer of fiction. I find it interesting that they apply so well to how I feel about teaching math!

Teach with a goal.

“Start as close to the end as possible... Give your readers as much information as possible as soon as possible. To heck with suspense. Readers should have such complete understanding of what is going on, where and why, that they could finish the story themselves, should cockroaches eat the last few pages.”

When teaching, I find it helpful to begin with a concrete example, prior to stating definitions or theorems, or outlining methods for solving problems. Beginning the section on homogeneous linear differential equations by actually solving one allows me to refer back to the example when making definitions later. In particular, I can point to the worked example and describe which part makes it “homogeneous”, which part makes it “linear”, and so on. This not only motivates the material we are working on, it keeps the class goal oriented, and assures the students that I am not wasting their time: soon, they too will be able to solve these equations! This also gets them asking about non-examples- What is an inhomogeneous equation? What is a nonlinear equation? This keeps the class interesting and moving forward.

This mode of thinking also works on multiple scales. I recall a great class on Galois theory where the professor reminded us first of our long term goals (“We are working towards showing that there can NOT be a quintic equation!”), then of the tools we had worked through recently, and how they fit into the grand scheme (“We have been developing results about solvable groups, which we can associate with a polynomial to detect whether it may be solved with radicals, in hopes of finding a quintic equation whose Galois group is not solvable.”), and finally anticipates what we would do in class (“Today we define a Galois group in pursuit of this.”). I find this strategy of keeping students focused on the big picture, reminding them of what we have done in the past, and of what we will do in the future helps keep a class engaged and comprehending.
Teach honestly.

“Be a sadist. Now matter how sweet and innocent your leading characters, make awful things happen to them – in order that the reader may see what they are made of.”

There are certainly beautiful results in math, but often to appreciate their beauty, one must see how bad the situation could be. As an example, I think of the linear algebra courses I have taught, where we start with square invertible matrices, the nice guys of the matrix world. But until we start talking about singular or rectangular matrices, it is hard for students to realize exactly how nice square invertible matrices are. More generally, there is a danger to teach math as it is worked out and beautiful, rather than showing the parts of math that are maybe not quite as nice. This not only is misleading, but cheapens how great certain results actually are.

I emphasize often that most differential equations are not solvable in a closed form, or, to calculus students, that most integrals are hopeless, which motivates using numerical methods instead. In support of this, I even designed a number of linear algebra problems that could only be solved using computer aid (in particular, MATLAB), which I offered as extra credit to my students. I think it would be a disservice to have students leave my class thinking that they could solve most equations, rather than being realistic (and indeed delighted!) about the theory they know.

Mutual Respect.

“Use the time of a total stranger in such a way that he or she will not feel the time was wasted.”

I have noticed that many of the professors who have inspired me to want to teach made it abundantly clear how invested they were in my success. I am inspired by a political science professor who met with me at one o’clock in the morning during finals week to discuss comments on my previous paper, an economics professor who would teach with such ferocity that he would sweat through his shirt by the end of a course, and the math professor who knew the name of every student in class on the first day. When I look for role models in my life, I think of teachers like this who made sure to give their students every opportunity to succeed.

In light of this, I try to make sure my students know I am invested in their learning, and that we are on the same team. By fostering this feeling of working
together to learn a subject, I have found that students are then more likely to ask questions, and come to me with their comments and suggestions about the class.

Keeping this feeling of being collegial, rather than making students feel as though it is them vs. the professor is especially tricky when writing exams. I was particularly proud of a student course review that said my tests were “fair and straightforward if you knew the material,” a sentiment that has been echoed by students I have spoken to, regardless of their performance on the exam.

Conclusion.

“Every character should want something, even if it is only a glass of water.”

Judging from feedback, students have had a great experience taking courses from me, just as I have had a great experience teaching these courses. After all the work that went into the course, the comments from students (which I am happy to provide) were overwhelmingly positive, and affirmed for me that the students had, in fact, found the course valuable. It is my goal to continue making such a worthwhile impact on students’ educations.