

## Teaching Statement - Daniel Katz

*Note: In addition to the following statement, I have posted a detailed Teaching Portfolio online, which contains evaluations of my teaching, sample course materials, and reflections on specific courses. It can be viewed at the following URL:*

<http://math.brown.edu/~thedan/math/portfolio/>

Strong teaching is a complex and delicate art; there are plenty of decisions to be made during preparation, instruction, and assessment, and every choice has consequences. In an attempt to bring order to the chaos, I would like to discuss two key concepts that serve as the foundation for my teaching: strong communication and student awareness. I will then discuss my own teaching history as a graduate student, and some particular lessons these experiences have taught me.

The first of my keys to quality teaching is clear and compelling communication. Stripped down to its essence, teaching is the art of conveying information you have to someone else who doesn't, and this can be done well or badly. If you were telling a story to a friend, you wouldn't do so in a lifeless monotone voice, and yet I have observed more than one lecture where a speaker makes this their communication strategy. I do not believe a good teacher has to be a master communicator, but I do believe they need to be conscious of their communication and interested in improving it.

I happen to have more than a decade of experience as a stage actor, and I find that many of the skills I've picked up in the theater, such as vocal projection, tonal variation, and consciousness of body language, translate extremely well to teaching. This doesn't mean my lectures are histrionic performances; it simply means that while presenting the day's material, part of me is focused on grabbing my audience's attention and maintaining it, making that presentation more effective. This clarity extends to the organization of a lecture; a discourse filled with interactivity and clear objectives is going to be far easier to comprehend than a hodgepodge of assorted ideas presented as they come to mind.

Communication is a two-way street, and while speaking one must also be listening. Through the varied courses I have taught at Brown, I've learned to detect the difference between a bored class and an enthused one, and similarly between a class that is absorbing the material and one that has no idea what's going on. Taking in this feedback is crucial, as it tells you how to adapt both the way you are presenting your mathematics and the style in which you are communicating it. The optimal next move might be to clarify earlier points, present an extra example, or simply ramp up your energy, but you will never know which if you are not paying attention.

The second key to my approach is trying to view every academic situation from the student's perspective. In a mathematics course, where problem sets usually outnumber papers, most of your assessments yield numerical data, and even if you are keeping track of your class's overall grades, it is perilously easy to look at a student's results and mentally equate them with "84 average." This is a road to ineffective teaching,

Suppose that a student fails a midterm exam. It might be tempting to write this student off as a lost cause, but in reality, there are many different reasons the student may have failed. Perhaps the course is moving too fast for him and he needs a tutor. Perhaps he is new to college and has not yet developed proper study skills. Perhaps he has questions he is afraid to ask during office hours. Perhaps he does not understand which concepts are important and has been focused on the

wrong ideas. Each of these problems has potential solutions, but one must identify the issue before one can address it, and that requires paying attention to more than quantitative results.

This philosophy should not be confused with blanket sympathy or an “easy A”; a student who does not meet my standards for a grade will not receive that grade. Each of the problems described above can be addressed by the teacher, but they need to be addressed by the student as well. Ultimately, it is the teacher’s job to provide students with the proper tools to learn mathematics, but the student must pick up those tools and use them to succeed. Still, choosing which tactics and support to provide requires attention to the student’s experience, and a willingness to view the course through their eyes.

During my graduate stint at Brown, I have taught seven mathematics courses, covering linear algebra, number theory, and single-variable calculus ranging from introductory to advanced placement. Most of my students have been undergraduates, but I have also had the pleasure to teach gifted high school students during the summer. Three of these courses were overseen by faculty course heads; for the other four I constructed my own syllabus, homework assignments, and exams, a valuable experience that has given me insight into how courses are built from the ground up. I’ve also tutored in Brown’s Math Resource Center for five years, which has given me perspective on how all of the introductory courses are structured and which topics students struggle with.

Teaching students at various levels has convinced me that a well-designed mathematics course, in addition to informing, should develop students’ mathematical maturity. A freshman calculus course should stress the study strategies that students need to employ in university-level mathematics. A more advanced calculus course should start to lay the foundation for how calculus can be applied in higher mathematics. A linear algebra course, in which most students encounter abstract proofs for the first time, needs to serve as a tutorial in methods of proof. Ideally a student who completes the core mathematics curriculum should develop skills that make future learning more effective. The best teaching lasts beyond the final exam.

I have also learned that there is a delicate balance to be achieved between variety and regularity. Some of the most successful lectures I have given have been “outside the box” diversions, such as a group decoding exercise to demonstrate RSA encryption, or a computer visualization of differential equations. At the same time, I try to develop a rhythm in my lectures, with regular occurrences such as weekly question and answer periods, homework discussions, and a bit of review at the beginning of each lecture. A course consisting entirely of repetition could become tiresome, while a semester of nothing but “gimmick” lectures would be chaotic; the ideal lies in a combination of routine and occasional departures.

There are many more specifics I could explore about teaching: how to write effective exams, ways to incorporate applications, and countless others. Ultimately, however, I feel that all these strategies serve the two basic goals of communicating effectively and putting yourself in your students’ shoes. Through my various teaching experiences, I feel I have learned to accomplish these goals more and more capably, and I look forward to continuing to hone my craft and enrich my students’ academic experiences.