

Statement of Teaching Philosophy

Nitsan Ben-Gal

I consider it important for students to not only gain understanding and intuition about the mathematical subject they are studying, but also to learn about its applications and its connections to other branches of mathematics and related sciences. In this day and age, the number of students who come into college with a real passion for mathematics is distressingly small. Courses from freshman to graduate level are filled with students majoring in engineering, economics, computer science, physics, geology, and chemistry. To them, mathematics is something they must memorize to do their work, or less, something they must pass to get out of the way. It has been my experience that a truly capable and devoted teacher can inculcate not only those skills and ideas necessary to gain proficiency in the subject they teach, but an appreciation of and desire to use these skills and ideas.

I view mathematics as capable of piercing to the hidden truths of so many aspects of the world. It is mathematics and its related sciences which seek to explain not only what is, but what might be, or even what can only be captured in thought, such as in many theoretical fields within mathematics. There are very few areas of mathematics that have not had some small part used in the applied sciences, and this is especially true in introductory courses. Explaining the use of eigenvalues in google searches can make what many of my students initially viewed as a dull topic seem suddenly useful, and omnipresent. Discussing how delay differential equations are being used in researching new courses of AIDS treatment and current work in dynamical systems is developing treatments for Parkinson's disease suddenly makes these subjects seem important and powerful to students who might otherwise have overlooked them.

In addition, I consider mathematics to be a truly interconnected subject. Few students realize until much later, if ever, how the different topics and techniques they use in one course pervade so many other types of mathematics. When I teach mathematics, I work to ensure that all of this is conveyed. In teaching dynamical systems courses I have shown how different topics and techniques relate to numerical analysis, linear algebra, physics, engineering, partial differential equations, functional analysis, algebra and a number of other fields. In teaching introductory courses such as calculus and differential equations, I have discussed the wide range of applications of the techniques to many of the fields just mentioned. I believe that allowing students to view an idea from multiple and different directions is crucial for encouraging real understanding, and with that, excellence.

I consider it important to present concepts from multiple viewpoints, and with concrete examples. Students have a wide range of learning styles, and I believe a good teacher must address as many styles as possible in order to successfully transmit knowledge to an audience. In my teaching experience I have found that both analogies and reformulating a problem in terms of a subject the students already have experience with are tremendously helpful to students' ability to grasp new material. I also expand on ideas with specific

examples, even in the theoretical topics. This allows students who have more difficulty with the theoretical aspects of a concept to have a solid foundation with which to build their understanding, and students who have difficulties seeing the applications of a topic in theoretical mathematics to watch how this may be done. Although no one example may encompass all the possibilities of any topic, it can provide a crucial starting point onto which greater knowledge may be grafted.

I also make my courses as interactive as possible, for as many students as possible. From introductory physics to graduate level dynamical systems, I ask my students to come up with the next step in the example problem, a possible application of the technique, or a reason why an intuitive guess might be incorrect. I do not let any one student shoulder the burden alone. I remember courses where the entire class was up at the board, trying to figure out why the example Plykin Attractor could not exist as drawn, and what adjustments would have to be made in order to make it mathematically possible. When students help to teach themselves, they develop more confidence in their abilities and more courage to try difficult subjects. When students know that they are not alone in this, and that they will not be penalized for incorrect guesses, they feel less afraid to do so. The students who were all at the board in the last weeks of the class were as quiet and hesitant as any others during the first few weeks.

Additionally, I have a great deal of experience working with students from a variety of international backgrounds and educational experiences. Through my dual positions at Brown University and the Freie Universität Berlin, as well as my experience in the AWM Mentor Network, I have mentored students from the United States, Germany, Israel, and India. Additionally, my time in Germany has allowed me to experience a number of the challenges international students are faced with when they pursue higher education in another country. Thus, I am uniquely suited to help international students adapt quickly and smoothly to the added difficulties inherent in attending a university in a foreign country.

In sum, I believe an interactive teaching methodology, combined with a wide range of styles and viewpoints per topic, and concrete examples emphasizing connections between topics and fields are the keys to producing enthusiastic, knowledgeable, and mathematically adventurous students. I believe my training and experience, as well as the unique background I bring to my role as a teacher, make me capable of leading students to achievements beyond their own expectations. Although I never lacked enthusiasm for mathematics, I have been quite fortunate to have had a number of wonderful professors who instilled in me the ability to obtain deep and broad knowledge and understanding on my own, and equally importantly, the awareness of my true potential to do so. This is what I seek to do for the next generation of students. The light in the eyes of a student when they come to realize they are capable of something they once thought beyond them or never imagined is breathtaking; it is one of the things that makes teaching truly worthwhile for me.

Nitsan Ben-Gal
Division of Applied Mathematics
Brown University
182 George St., Box F
Providence, RI 02912
bengal@dam.brown.edu
<http://www.dam.brown.edu/people/bengal>