

TEACHING PHILOSOPHY MASOUD KAMGARPOUR

I believe mathematics originates from our quest to understand the world around us. My first goal as a teacher is to help students understand the questions that motivate mathematics. To do so, I relate new mathematical concepts to familiar ideas drawn both from within mathematics and from everyday life. I also encourage students to explore new concepts in different ways, through lecture, questions, group discussion and individual work. I continually strive to improve my teaching by seeking out feedback from my students, fellow teachers, and experts in the field.

At the beginning of every topic discussed in class, I make sure that the students understand *why* the subject is important by drawing on both historical developments within mathematics as well as applications to physics, economics and everyday life. For example, when shifting from the study of rational numbers to the study of real numbers, I spend a considerable amount of time explaining the importance of real numbers for measuring distances. I illustrate this by explaining that irrational numbers are necessary for measuring the length of the hypotenuse of a right triangle. I point out that it took many centuries to develop real numbers and longer still to appreciate their effectiveness. By emphasizing the evolution of mathematics as a science, I try to communicate to my students the value and power of what they are learning.

Mathematics has an intrinsic beauty which, I believe, makes it similar to music. I have tried to demonstrate this similarity to my students in various ways. The first time I taught a calculus course I asked my students to define derivative. Their answers contained some of the relevant words: “slope”, “tangent”, “line”; however, very few people were able to put the right words in the correct order. Many of them understood the individually defined concepts of slope, tangent and line, but had more difficulty grasping their relationships to one another and to the notion of derivative. To illustrate the shortcomings of their definitions, I wrote down the notes of the “Happy Birthday” song and pointed out to them that if they changed either the notes or their order, the result is no longer the same song.

In addition to relating new mathematical concepts to familiar ones, I try to engage my students by encouraging various forms of participation in class. During lecture, for example, I occasionally direct an explanation to a single student. This allows me to interact individually with students to better gauge their level of attention and understanding. I also continually ask students to answer questions to ensure that they are following the material and to encourage them to participate actively in class. In cases where no student offers an answer, I give them a few minutes to discuss the question in small groups. This gives students a chance to explore concepts collectively, with some guidance from me to make sure they are on the right track. I then ask them to explain their solutions to their classmates. This forces presenters to clearly formulate their ideas and gives the other students an opportunity to see concepts presented from a different point of view.

I have enjoyed teaching calculus and pre-calculus and would like to teach these courses in the future. I would also like to teach higher level mathematics. I like to design and teach an undergraduate course on abstract algebra and organize a graduate seminar on representation theory. The undergraduate course would begin with a discussion of symmetries and the notion of a group, and then continue onto an in-depth discussion of linear algebra and elementary representation theory. I would then introduce rings and fields and conclude with a discussion of Galois theory. The graduate seminar on representation theory would consist of weekly presentations by various speakers, including graduate students, post-doctoral fellows, professors and invited lecturers. The format would allow for longer, more in-depth and more diverse discussions of topics than can occur in an hour-long lecture.

I am always looking for ways to improve my teaching. As a student myself, I pay close attention to the techniques of my teachers. For example, I have adapted several of the strategies I observed in lectures given by Professor Philip Kutzko, such as encouraging participation by noting the value of each student's question. I have also integrated teaching methods suggested by Steven Krantz in his book, *How to Teach Mathematics*¹. This book helped me recognize how the the language, habits, and values of my students should influence how I communicate with my students. I have also sought feedback from the University of Chicago Center for Teaching and Learning, which sent observers into my classroom to evaluate and critique my teaching. I have integrated several of their suggestions into my classroom, such as giving students a chance to work in groups.

Teaching mathematics has been challenging for me. I have been surprised to find myself thinking about my class at odd times of the day: "Why were some of my students confused about absolute value?", "What homework problem should I assign to clarify this concept?", "Why was student X not responding to any of the questions I asked her?" I enjoy meeting the challenges that teaching brings and am very proud that my teaching efforts have been appreciated. Throughout my teaching career, my evaluations have been consistently excellent. This past year, I won the Lawrence and Josephine Graves Prize, which is awarded to the most effective teacher of undergraduate students. Most importantly, students have left my class with a greater appreciation of the beauty and power of mathematics.

¹American Mathematical Society, 1999