

Ideas about teaching

The most influential course I've attended was a graduate level introduction to mathematical logic at the University of Auckland. The circumstances were slightly unusual. It was taught by a topologist, David McIntyre; we sat in his office since there was only one other student. David based his lessons on Moore's method - we were given definitions of the basic concepts, followed by some fundamental theorems to prove ourselves and present in the following lesson. I thoroughly absorbed the material, and it was to form the basis of my graduate study. I probably did my best learning when my classmate presented a proof that I was unable to produce beforehand. Identifying the points in his proof that I did not think of trained me to get a feeling (and sometimes concrete ideas) for why and where my own reasoning had fallen short.

Although I have not taught a class using this method, the experience has informed my teaching - the best way to absorb mathematics is to do it. I have taught undergraduate courses at all levels, however always with a predetermined syllabus. Within these constraints I try to get my students to do as much mathematical reasoning of their own as possible, verbal and written.

I try to achieve this by asking questions (and expecting answers), and sometimes breaking for a short written exercise. This interaction often helps students realise that they don't yet understand an idea or technique well enough to work with it on their own. I like to give extension questions in tutorials. In a particular one-hour tutorial on introductory automata theory, I asked the students to come up with their own acceptance condition for automata operating on infinite strings and to analyse some basic properties such as expressive power. I tried to introduce the idea of finding a good definition for a problem (I guided them with scenarios from formal verification, using such concepts as liveness or safety).

I am quite keen to teach a course that follows the historical development of the subject. I think it helps appreciation of a subject if students understand the mathematical problems people were struggling with that led to the theory. I imagine this would be a worthwhile experiment with a first course in calculus.

I also enjoy participating in a course that follows a book, and requires each student to present some material from it. As a graduate student I learned modal logic and some model theory this way.

Experience

I am comfortable teaching any undergraduate course in pure mathematics or theoretical computer science. I am always interested in teaching something new, especially

if it forces me to learn a new area of mathematics.

At the graduate level I co-taught a five day course at ESSLLI 2006 with Valentin Goranko in the area of logic and computation. I have collaborated with a number of PhD students, resulting in two publications. Although this is limited experience with teaching at the graduate level, I am quite comfortable teaching in my area of speciality - logic and computation.

My particular strengths, based on experience and familiarity with the material, are in design and analysis of algorithms, discrete mathematics, mathematical logic, algorithmic information theory, complexity theory, and the theory of computation.