Statement of Teaching Philosophy and Experience

Lars Kadison

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Teaching at a university is done at many levels from pre-calculus to an advanced graduate course, and even Ph.D. supervision. I have experience from beginning calculus through math major courses, first and second year graduate courses in algebra (and once in mathematical biology), and Ph.D. supervision (twice). Some of my math major courses have been on exotic topics such as History of Calculus, Probablity and Statistics at the University of Pennsylvania, and History of Mathematics with Problems for Future Math Teachers at the University of Trondheim, Norway. To begin somewhere more concrete, teaching a course for mathematics majors often involves an important choice of syllabus and textbooks. If proofs are being taught for the first time, this can be a very important choice. For example, I think that learning proofs in abstract algebra is best motivated within a course in plane geometry — with groups appearing as transformation groups and rings or fields appearing as the coordinatization of the axioms of planar geometry. I have tried to teach abstract algebra from Herstein [1] as well as Rotman [6]; although both write about this subject with a living presence, the students (such as the ones I experienced) find the study of groups largely unmotivated and the course benefits only the best students. In my next three times giving courses at this level, I took a better and more historical approach to teaching abstract algebra. My three courses in planar geometry were successful in that the students worked diligently at learning the theory of groups, rings and fields. Although they did not learn as much as they could have in a full course in abstract algebra, they gained the motivation to read some more on their own, or to sign up for such a course with an intellectually motivated attitude. With the help of Robin Hartshorne at Berkeley, my student Kromann and I produced after the second and third such course a textbook on projective geometry which mixes analytic and synthetic geometry with abstract algebra in our bid for a pedagogically correct mix of ingredients [2]. Fortunately, we don't always have to write our own textbooks, as others have written historically (or otherwise) compatible textbooks; for example, Stalker's book on complex analysis [7].

Other courses will have a fixed syllabus and perhaps a very large attendance.

Here the teacher will want to be very service-minded. I have experience teaching large lecture courses in Calculus in U.C. San Diego, U. New Hampshire and University of Pennsylvania, with no complaints and good scores on the teaching evaluations (posted on my webpage). Preparing extra well is important too the first time giving a course such as the courses I gave in Mathematical Biology for first-year life science graduates or the course in P.D.E's I gave both in U.N.H. Teaching to the large majority of moderately prepared students is important. Writing neatly on the blackboard, speaking in a voice appropriate for the room or the technology, dressing respectably, and covering the basics are the essentials; striking the right balance between too much and too little stimulation is also part of the ongoing process of good teaching. Being ready in office hours to encourage the good students, perhaps with an extra challenge, and advise or help students who are doing poorly is another tool in good teaching practice.

The university teacher is a practical person who is engaged in research as well as teaching, and strikes a balance between the two. I have enjoyed reading books by Steven Krantz on teaching and the related topic of writing and communicating [3, 4]. It is good idea to read about, experience or discuss alternative teaching methods as possibilities rather than cure-alls. There are situations, such as in small courses or supervision of student papers and theses, when newer techniques such as those discussed in Pólya's book [5] are useful.

There is as much positive to be said for research-based teaching, where university students are taught by researchers who have a sense for the important material and questions, as there is for teaching-based research. To quote Klein and Lie in their report on the good points of French mathematics with respect to German mathematics around 1870 [8, p. 162]:

> The practical purpose of a mathematical research article is to increase understanding among the researcher's mathematical colleagues, not just to increase their admiration for the author.

I think that teaching at any level lends a concrete experience to one's research that provides grounding for the mathematician, like experiments for the physicist. For example, whether at the research level or in a calculus course, we should learn the important computational relations at the most basic level of instinct. Also, writing a successful paper is quite similar to giving a successful course. Finally, the teaching aspect in a good conference talk or colloquium has quite a lot in common with teaching in a course.

I supervised two students (a Scottish and a Costa Rican) from their qualifying exams through to their completed theses and Defences for the Mathematics Ph.D at the University of Porto from 2010-2016, one of whom is continuing in post-doctoral studies in Sao Paolo, Brazil, and the other is beginning an assistant professorship in the University of Costa Rica.

References

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