Statement of Teaching Philosophy

Lourdes Juan

Teaching is an art, and teaching mathematics is a particularly challenging medium for that art. Those of us who have reached the doctoral level have spent many years as students. We have seen our subjects taught well, not-so-well, or even not at all, at various times. We have learned to teach first by watching, and then by doing, in the courses we have taught as graduate assistants. I have been fortunate to be able to teach a wide variety of subjects, both elementary and relatively advanced, and I hope that I am already well on the way to mastering the nuances of classroom lecturing to students of differing experience and capabilities, of managing courses of various sizes, and of understanding the human as well as the technical sides of teaching and learning mathematics.

But today’s academicians face new and perhaps unprecedented challenges, as a wave of technological advances are being integrated, haphazardly and with varying degrees of success, into the educational system. Indeed, the very concept of classroom is undergoing reconstruction, as internet technologies are enabling the traditional course to be delivered at low cost over great distances. In the coming era, colleges and universities will need to adapt to a rapidly-changing terrain, and to compete as never before with alternative deliverers of information and knowledge.

I am a vigorous proponent of technologies that extend or enhance the delivery of the traditional mathematics course. As courses move outside of the traditional classroom, through video or internet technology, they will naturally have to undergo some changes. At least in its initial stages this is likely to be more of a technical reformulation than a true revision in concept and content, and as such I see enormous potential benefit with little reason for concern. In the restricted and deprived environment of Cuba, I had to struggle to obtain a good undergraduate education, and I even had to leave my own family and country behind in order to obtain the kind of graduate education that I believe is necessary to be a good mathematician. Consequently, I have a deep awareness of the need to broaden educational opportunities. Increasing the availability and improving the distribution of knowledge through internet technology will be an exciting frontier for many years to come, with dramatic opportunities for making the benefits of higher education available to nontraditional geographic or economic groups.

I have used internet technology to expand the classroom in some ways. While at the University of Oklahoma, I used the local “CourseNet” to communicate with the students in my classes by email, and to set up a bulletin board for students to use. This facilitated communication between the students and myself, and between the students and each other, while at the same time had negligible cost in terms of time (both the students’ and my own).

I have my own website, which I use as a distribution center for a variety of course information and materials. I plan to work to develop nontraditional learning environments. In this direction I have already developed an independent study course of Calculus and Analytic Geometry II online for the Independent Study Department of the University of Oklahoma. This course will be mainly used by students in
the U. S. Navy who spend long periods away in submarines and consequently cannot make it to class. (This course can be viewed on my website at the address www.msri.org/people/members/ljuan.)

With technologies that require a change in the pedagogical approach or even the mathematical content of a course, I am more cautious. I have found that innocent-looking innovations can alter the course structure and curriculum in ways more profound than we may at first realize. Unless we believe that students’ fascination with these technologies will radically alter their study habits, we must assume that we have already maximized the amount of time that they are destined to spend learning what we ask them to learn. Thus every task that requires our students to learn to operate calculators or computer software expends time that traditionally has been used for mastering other course skills. If we cannot clearly see how time will be saved, by reducing effort needed to build the internal constructs, by eliminating calculations that really do not have educational value, or by some other means, then we must assume that something previously considered worthwhile will be lost. In this case, the value of the new skill must be at least as great as what it replaces. I believe that hard questions should be asked, and insofar as possible answered, before we transfer student effort from the traditional curriculum into one which may be fashionable, but relatively untested. I am especially concerned because some of the presentations I have seen by mathematics education specialists display a clear bias toward the introduction of technology. At times, it seems as though any technology will do, that the attitude is not “will this really improve students’ learning, and if so, how?” but rather “obviously this is a good thing, how can we find a new way to use it?”

For example, let us consider the graphics calculators widely used in introductory calculus. They take a certain time and effort for students to learn, and present some technical problems with regard to examinations (they increase the difficulty of measuring mathematical understanding, as opposed to calculator prowess, and also allow new opportunities for academic misconduct). But if not used in a thoughtful way, they have more insidious dangers. They encourage the natural tendency of many students to become assembly-line workers (who develop algorithmic procedures for solving specific types of problems) rather than artisans (who have mastered a small but powerful repertoire of conceptual tools to be summoned as appropriate to the problem at hand). When I use graphing calculators in beginning calculus, I withold them until all the traditional ideas required for graphing have been discussed and used. Then, I tell the students exactly what the technology does (in this case, plots points), and its strengths and weaknesses (it can give a great deal of information about a small portion of the graph, but it can omit important features when used on a large scale).

I describe it as a specialized tool that one uses to get detail on a portion of the graph that we have good reason to believe (from using other ideas of calculus) will be interesting. The technology must be placed in its proper perspective, so that it does not encourage undesirable tendencies, or even replace the subject being taught.

In summary, I see tremendous potential for the use of technology in mathematics education. I am intrigued by the prospect of increasing the availability of higher learning, above all to those who historically have not had access. With regard to innovations that change the actual course content, I am in a much more conservative
camp. I think that hard questions need to be asked and answered before we make wholesale alterations to the curriculum.