

My Mentoring Philosophy

by Luise-Charlotte Kappe

"Writing my teaching philosophy is the hardest thing I ever did. I agonized over it for more than a week and have nothing to show for it other than a rough draft". This is what Ph.D. students preparing to do battle with the job market usually tell me and my advice is: "Don't philosophize, be concrete!" Since they have taken my advice, I am planning to stick to it too in writing my own mentoring philosophy.

My mentoring at the graduate level seems at first glance to have been in two different arenas: mentoring Ph.D.-students in writing their dissertation and mentoring them in preparation for their future faculty roles. For me and for the students these two aspects are intimately connected - the second is a natural outgrowth of the first. But more about this later on.

There are common features in going about the task of writing a dissertation which hold for every discipline. But there are also vast differences from discipline to discipline and, as I perceive it, the differences between mathematics and other disciplines appear to be the greatest. Before I can explain this, let me say a few words about research in my discipline.

Mathematical research is an enigma to almost any outsider and the titles of papers and dissertations don't convey any meaning to the average lay person. But, after all, there is a two-and-a-half thousand year old tradition of mathematical research, older than in any other discipline and still valid. Let me explain it by using a familiar example: When Einstein developed his theory of relativity, the mathematical models had already been developed fifty years earlier and Einstein just had to choose the right one. Mathematicians are like oak trees, producing thousands of acorns of which only a few will develop into trees later on. Just as one can't tell an oak tree only to produce those acorns which will develop into trees, one can't tell mathematicians to develop only those theories useful for the Einsteins of the future. Furthermore, mathematicians are best off in their research not to think about the Einsteins of the future.

To stay with the same metaphor, how do you get your Ph.D. students to produce those acorns? It is clear that this can't be a "how-to" manual of Ph.D. advice. But I want to give at least an idea how I perceive the task of advising Ph.D.'s. For me it is very much like taking in an apprentice as master craftsmen and artisans did a long time ago. An apprentice first works alongside his master and gains more and more independence, leading hopefully to the creation of a masterpiece. Albrecht Dürer, the great German renaissance artist, was apprenticed to Michael Wohlgemut, a painter in his own right, and, as things came along, eventually "Dürer painted Dürers". Historically speaking, academia may have modelled Ph.D.-education after the apprenticeship for craftsmen.

How do you start working with Ph.D. students? For me that seems to be a very important question. I start with my students in a familiar setting: solving problems. This is something they have been good at before. Otherwise they would not be where they are now: starting their dissertation research. The difference is that the problems are open ended, the target of the investigation is not visible immediately and finding the target becomes part of the problem, in other words, the students learn to dare to make conjectures.

This first part of the apprenticeship is pretty intense, involving one-on-one meetings several times a week. But as soon as the advisee comes up with a result of his or her own, the self-confidence soars and the research propels itself forward. To reach this point is one of my first goals.

One very important part for me in this first phase is to get to know my students as persons and adjust my approach to their different needs. No two people are alike and for that matter, no two Ph.D. students in group theory are alike. Knowing someone makes things so much easier and one can anticipate problems and work on solutions before they interfere with the progress of the dissertation.

On the other hand, I want my students to get to know me so that I can become a role model for them, helping to overcome some of the difficulties they are facing in the course of this endeavor, such as the occasional motivational problems and above all, time management. There are just not enough hours in the day to do research and all the other things which might be equally pressing. I count myself lucky that I never had motivational problems with my own research. I miss something if there is not some research in my life. Research keeps me sane.

But time management is always a problem and these bright young people may be experiencing this for the first time in their life. I haven't found a miracle cure but my catch-word is: find niches!

Here are mine. The students have to look at their daily lives to find theirs. I like to do most kinds of housework like dish washing and cooking and light gardening. They are not too strenuous and I can think about my mathematics.

Driving a car for long distances is one of the most wasteful uses of your time and brain. But I don't advocate thinking math while driving. Another niche to be avoided is doing math while trying to fall asleep, but I have to admit doing this once in a while. Whenever I can, I use other forms of transportation: trains, planes, and buses are great. For long stretches one is idle, just sitting and waiting. Whenever I see a certain theorem of mine, I remember fondly waiting at the Pittsburgh airport for my delayed plane. That is where I got the idea. The ultimate time niche is sitting in the dentist's chair. I remember great Eureka moments there!

With all those niches, I still need some uninterrupted time just for writing up all the great ideas I got. My favorite time for doing this is Saturday mornings. Most people do their laundry then. I do this too. A little timer, set on half hour intervals, keeps me focused on my task. When it rings, I have a legitimate excuse to get up to the washer, a very invigorating break, better than the trip to the refrigerator. Just to convince you, it was a Saturday when I drafted this mentoring philosophy and the timer was right by my side.

Lastly, in this context, I should say something about choosing dissertation topics. Undeniably it is an important factor for the success of this endeavor. It does not start out with a firm topic telling a Ph.D. student what theorem to prove, rather it is exploring an area and the topic evolves as things move along. There should be enough room to branch out in different directions and also to continue research in this area once the dissertation is finished. It is clear that there are no golden rules for picking promising areas and topics. It's all intuition and experience and over the years I apparently developed "a feel for it".

One thing I always try to avoid is having my students work on hot problems which all the experts try to solve. Often these are the only problems students know when they come to me. But once I give them the reasons for why I don't want them to work on the problem, they agree that it is better to work in a more sheltered environment. At first, their topic may not be as glamorous as they had thought. But as soon as the first of their own results are there, this is forgotten, and who knows if these innocent-looking theorems are not the acorns developing into the oak trees of tomorrow.

No matter how hard my Ph.D. students and I try to avoid it, there will be a good deal of aggravation, frustration and stress with it, be it that the student maneuvers her-or himself into a corner by wanting to crack that very specific problem, or in an obscure journal a theorem is found which is part of the student's results. Learning to cope with such things is part of the Ph.D. education. Mathematics is a nerve-racking business, but the rewards for having created our own piece of mathematics outweigh such stress, so that we have to take such things in our stride.

It's time to talk about the second half of my mentoring activity, namely, helping Ph.D. students preparing for their future faculty roles. Some of the topics I discussed in earlier sections belong to both aspects of the mentoring business, showing that there is a strong connection between the two. Let me get back once more to my earlier picture, comparing apprenticeship and Ph.D. advice. It was an established tradition that the apprentice lived in the house of the master craftsman and so was part of the family. This certainly gave the apprentice an opportunity to learn how life would be once he became a master craftsman himself. In the same way as craftsmen recognized that there is more to becoming a master in the trade than knowing the tricks of the shop, it should be recognized that there is more to getting a Ph.D. than writing a dissertation. But what is this "more"? It is certainly not that the

Ph.D.- student moves in with the Ph.D. advisor's family. It appears that very little has been known about this in a concrete way until fairly recently.

Everyone familiar with the situation agrees that Graduate School in its present form does not prepare Ph.D. students for their future roles as faculty members. This was recognized several years ago and various sources, such as the Pew Charitable Trust and the Department of Education, awarded grants to universities to develop programs addressing the issues. These programs were administered in cooperation with individual departments by various entities in the university: Education Schools, Graduate Schools or special units. More about all these programs can be found on the following website:

www.preparing-faculty.org In 1999, NSF in conjunction with AAC&U and the Council of Graduate Schools launched a new initiative in this direction which is discipline-specific. The disciplines are Biology, Chemistry, Physics, CS and Mathematics. The professional organizations in the various disciplines are charged with the grant administration, including the call for proposals. It is interesting to know that the initial driving force to get this started was a recognized need to improve the quality of undergraduate education in mathematics and the sciences. To achieve this goal, the logical next step was to better prepare Ph.D. students for their future role as faculty. In 1999 the Department of Mathematical Sciences was awarded such a grant with me as the principal investigator.

What led me to apply for such a grant? First it was my own personal experience. I was born and educated in Germany where I also obtained my Ph.D. Shortly thereafter I got married to Wolfgang Kappe, a fellow mathematician. On the advice of his Ph.D. advisor we immigrated to the US and spent the first five years at Ohio State. The main reason for coming to this country was that there were no opportunities for husband-and-wife teams in Germany at that time and not much has changed since then.

At Ohio State it was the first time that I taught a class for which I had full responsibility. I had less preparation than the typical new assistant professor who at least taught some courses as a graduate student. The German education to become an academic is bare of any preparation for the teaching component of the job. In addition, here I was facing a different language and a different culture. It was a sink or swim situation and I decided to swim.

When I started working with Ph.D. students, I was reminded of my own rough entry into the profession and decided to incorporate some other aspects in their training, aside from getting them to write a dissertation. One has to tread somewhat carefully here, since the first priority for Ph.D. students is to get a firm foothold in their research. Once this is accomplished, they open up to the idea that they have to broaden the horizon of their professional education.

So it comes that some of the practices incorporated into our "Preparing Future Faculty" program (PFF) are an outgrowth of these efforts, and we had already evidence that they have been effective. I want to mention here some of them.

It is our tradition to take along our Ph.D. students to small professional meetings in our research area as soon as they have results of their own which they can present. This always works as a tremendous confidence builder, whereas just taking them along without having anything to present turns out to be very demoralizing.

I was fortunate that those of my Ph.D. students who ended up in academia all enjoyed teaching, perhaps otherwise they would not have gone that route. Some of them already had prior experience teaching at other colleges before entering the Ph.D. program, bringing them up a few notches on the experience ladder when it came to job searches. It needed no prodding on my part for others to get similar experiences outside our school during the summer, which they all found very valuable.

Another experience which turned out to be highly valued by future employers was giving our graduate students the opportunity to act as mentors and coaches in our Undergraduate Algebra Seminar. This seminar is attended by the best of our undergraduates, the ones who are graduate-school bound. The role of the mentor is to prepare the students for their talks and to coach them in presenting them.

Lastly, I have always looked after my own students, when they were preparing applications and resumé's. But the

word spread among all our graduate students that it would be a good idea to check with me when preparing applications. So, at one time or another, almost every graduate student passes through my office when starting the job search.

Aside from the practices in our PFF program rooted in my own experiences as a new faculty member, there is another source for such practices, namely the "Preparing Future Professors" program, which we had here in our department a few years before the PFF program. It was coordinated by my colleague Patricia McAuley. Several features of this program were integrated into the PFF program, like faculty and peer mentoring and the speaker series, where graduate students give talks to undergraduates. These talks given first here on campus and then on extended visits to partner institutions became one of the most successful parts of the current PFF program.

It goes beyond the scope of this report, entitled "Mentoring Philosophy", to talk about all the things done in the current PFF program. Those who want to learn more about them can go to the website of the program at:

matrix.math.binghamton.edu/dept/pff/ and look at my 2-year summary report about the program, included in this portfolio. In one of the numerous questionnaires and surveys I had to file with this grant I was asked to identify the best things of the program and I said "the sum of it all" and the enthusiasm with which our graduate students pursued the program, with ideas of their own which they implemented. Honestly, I was worried at the beginning how to motivate graduate students to participate. But that turned out to be the least of my worries. If there was a downside, it was the enormous amount of red tape generated by the five organizations overseeing this grant together with the campus office administering it. Perhaps you can't expect anything else in such a situation, but it would have helped very much if all the agencies could have coordinated their efforts.

An outgrowth of all these surveys are the reports written by PFF fellows who started their first jobs in Fall 2000 and 2001. These reports point to three things which were most beneficial to them: the mentoring program, the financial support to go to meetings, and the speaker program which enabled them to be prepared for the on-campus interview. All these reports are on our website and also included in this portfolio. Let me conclude this report with a quote from one of them:

"I would encourage all graduate students who plan on a career in academia to become involved with the PFF program. It was through my participation in the program, as well as my mentor's guidance, that I became fully prepared to join the job market and successfully earned an assistant professor position at a college. I can honestly say that the time and effort that I spent on the PFF program was definitely a worthwhile investment."

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