

Advice for Graduating Ph.D. Students

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What to tell a graduating Ph.D. student in mathematics? One thing we learned is that everybody has a different answer to this question. There are many different pressures placed upon a graduating Ph.D. student in mathematics. Those of us who have been out for a while receive these same pressures, just in different doses. And after being out for a few years, the pressures shift depending on your type of employment.

In the fall of 2005, the second author was invited to speak to the graduate students at Virginia Tech about these very issues. Email was sent to over 100 mathematicians, young and old, asking them the basic question “If you had one piece of advice to give to a graduating Ph.D. student in mathematics, what would it be?” The response was overwhelming. One person wrote considerably more than the others, and agreed to co-author this article. Feeling that the information may be of interest to a broader audience, we decided to share it with the mathematical community. In case any of the contributors might wish that their names not be mentioned, we are leaving the names out. Please know that we thank you all very kindly for your assistance. You know who you are.

Important

In what follows, we will assume that a graduating student answers the question “To be or not to be?” as “To be”. Unfortunately, this does not resolve all the problems. Everyone’s experience, circumstances and difficulties are so very special!

- *Your situation is not **that** special.* Many Doctors-of-Philosophy-to-be had similar problems of their own, the same ambitions, aspirations and doubts. Life for the young and talented is not easier than for, well, just about anybody else. Relax and stop blaming the circumstances. It is up to you to make choices. Remember Woody Allen: “The only thing standing between me and greatness is me.”

In what follows, we assume that you have sorted personal problems like finding a partner, dealing with parents, or owning a dog. What is left is research and teaching.

- *You may have mixed feelings about research. Make up your mind about this, at least for the first six years.*

- Do not question this decision every month and be ready to face the consequences.
 - Demography of institutions where people can do good research has changed. Availability of the internet, email and TeX, low rate telephone services, etc., help to cope with (or even make up for) the absence of a good library, limited resources for travel and absence of a colleague in the next room who can understand your math.
 - If you decide you will be doing research, it is clear what to do: read, think, call, email, go to conferences to meet others, many of whom are in the same position as you, and **collaborate**. If you do not have travel funds, pay your own way. Share driving and hotels with others. This way you can attend more meetings. Consider it as an investment in your future.
 - Read, read, read. One more time, **read**.
- *You may have mixed feelings about the role of teaching in your career.*
 - “*Those who cannot do teach. Those who cannot teach administrate.*” Both statements are false.
 - *Teaching can help you to become a better scholar.* This is true even if you teach only undergraduate courses. Think about what you teach and you will find many related questions crying for answers. Like “what if instead of assumption x , I use the alternate assumption y ?”, “can this be generalized?”, “how and why did this notion/theorem appear?”, “why is this boring theorem/exercise present in many texts? Why should I teach it? Clearly, these results are much better.” You get the point.
 - *Teaching can help you with your research.* It may help you to find new topics for your research. Listen to your students. They can ask good questions. It is certainly possible that an innocent question asked during a proof presented in class could lead you to a new research problem. (Note: this can be a source for good *undergraduate research* projects.)
Teaching often helps relieve the pressure built during failed research attempts, and the emotions you get from it can help you to resume your research program. Teaching (like kids, visiting the in-laws, or that flooded basement) is something you can blame your slow progress with research on. But do not believe the myth that success in one area (teaching or research) implies failure in the other.
 - *Teaching can hurt your research.* Primarily by taking time and energy, and by stirring negative emotions. This is especially true if you are an ambitious teacher. Be aware of this. You may like both research and teaching, but only so few of us can do both things really well *simultaneously*. Fortunately, there exists this wonderful time of year called SUMMER.

- *Find your niche in the profession.* Whatever you decide, you have to do something important and valuable. Follow your instinct.

Somewhat Important

- *Get on publishing that dissertation right away.* At the end of your thesis you may think that what you did was minor. “OK, it was sufficient for the degree, but who really needs it? Probably many people could do the same thing if they decided to work on it.” Wrong thinking. It is hard to judge the value of your work at this time. It’s very likely that, in ten or fifteen years, you will read what you published and be surprised with how nontrivial the logic and the arguments are! You will feel much better about the work. And no one can predict how your published word will echo in the future. And it is harmless.

If research isn’t a large component of the kind of job your looking for, it’s easy to forget all about it. Try to publish your Ph.D. thesis. You might even start putting your thesis into article form before graduation. This will help you to hit the ground running after graduation. Your Ph.D. thesis is your first class ticket to publication at this point in your life. Don’t let it go.

- *Take advantage of every speaking opportunity you can get towards the end of your time in graduate school.* You will, undoubtedly, be expected to give talks. If nothing else, you will be expected to speak to a diverse group while being interviewed for a job. You don’t want this to be a new experience.
- *Learn how to write well.* Mathematicians have a bad reputation for their writing skills. Don’t be one of *those* guys. Give details eloquently and understand that good writing comes with practice.
- *There is a difference between state schools and private schools.* For instance, when interviewing, you might discover that publicly supported schools often offer lower starting salaries, but better opportunities for salary increases over the years. Check out chronicle.com for data of faculty salaries. Remember to look not just at starting salaries, but also what associate professors are earning. Also, ask questions about benefits. This might be a new experience for you, but ask around. See how much people are paying for things like health insurance. Many public schools have very good insurance plans that beat the private schools.
- *Meet as many people as you can. Network. Go to conferences. Introduce yourself. Ask questions. Talk to people. If you make a good impression, the more people you meet, the better off you’ll be.* This requires no further explanation. Some mathematicians are quiet, aloof people. Don’t be one of those guys, especially when you’re fresh on the market.

- *A 12 hour teaching load and a high research expectation are not very compatible.* Many faculty teach 12 hours (or 4 courses) per semester and very much enjoy it. But be a little cautious of such a teaching load coupled with an expectation of three or more scholarly publications per year.
- *Keep all your options open and apply for different kinds of jobs.* This might be easier to say than to do. But you never know what's going to happen out there in the job market. Post-doc opportunities are more plentiful these days (especially for U.S. citizens), so don't rule such things out thinking that you have no chance. You could have the pleasure of learning a whole new area of mathematics while having a very low teaching load your first few years out of graduate school. Such experiences have far-reaching consequences.
- *Highly research focused Ph.D.s will have a hard time getting a job at a teaching oriented school, and conversely.* This is unfortunate, but true. If you send a 10-page research statement to a small liberal arts school with a 12 hour teaching load, you're definitely sending the wrong message. Consider making two application packets, one for the teaching oriented schools, and one for the bigger research oriented schools.
- *Don't be surprised if your first year of full time teaching seems more difficult and less fulfilling than you thought.* Reality check! Your first year out of graduate school will be difficult. You'll probably be teaching much more than what you are used to, and your schedule will change dramatically. Be ready.
- *Document your teaching material, even if it is in imperfect form.* This is excellent advice. How many times do you think you'll be teaching first semester calculus? Well, a lot. So make notes, write good quizzes and exams, and make nice handouts. Anything you do now will make your life easier down the road.
- *There will be many activities begging for your time, more than you can do in a 24-hour day. And most of them will be sensible worthwhile things to do. Learn when to say "Yes" and when to say "No".* You need to find your niche. If undergraduate research is your thing, then say yes to the opportunities that will help you to grow in that direction. If research is not your thing, agree to be on a university committee, or to teach a new course. Do say "yes." But also learn when saying "no" is the better answer.
- *Exhibit good "mathematical citizenship."* Have lunch with colleagues, discuss what new math you learned while preparing for today's class or what difficulties you had. Share and ask for interesting problems. Share clever student responses. Inform your colleagues about the last article you read in the *FOCUS* or *Notices*, or even in a newspaper. Talking about movies and gossiping is also allowed.

It is not always easy to be a *good* professor, and you may occasionally feel blue. We need each other; it is easier to jog with other people running next to you.

- *Work only on those problems which you really like.* It will make you happier. The consequences are obvious.

A final important note

There are many activities which are essential for the survival of our profession, but which, often, do not bring you much credit. For example, refereeing, reviewing, translating, editing the writing of a colleague, talking at length to students, posting a useful document on the web, etc. Do not be afraid to be generous with time spent on such things. Many people do notice and will be grateful. It helps to feel that you belong to something important, like the ETERNAL ORDER OF MATHEMATICIANS. The positive emotions you get will help you in your other activities, and life in general. Welcome aboard.