Advice for graduate students

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Over the years, I have thought and read a lot about how to stand out in this sometimes-confusing world of graduate research. Originally this was for my personal needs, and later I shared these ideas in conversations with advisees. I then started writing down ideas that came up repeatedly, in what eventually became this document. Of course, you will get differing and maybe even conflicting advice from others, but I hope that you find this useful or at least thought-provoking.

For further information, I have found Reis (2012) to be a great resource, and Michael Ernst has advice on related topics at `https://homes.cs.washington.edu/~mernst/advice/`.

1 Prioritize your health

Make sure that the pursuit of your professional goals does not jeopardize your health. Competing for desirable opportunities requires substantial focused effort, and there are aspects to this profession that certainly put stresses on other parts of life. But in an optimal situation, your research will be a passionate pursuit that stops short of taking over your life.

Because there are no boundaries on your time spent at work, and you will not get regular feedback as to whether you have 'done enough,' it can be easy to slip into an obsessed work schedule or to be overwhelmed by a sense that you aren't making progress. Here are a few tips:

- Schedule time for sleep, exercise and socializing, and protect that time[1].
- Keep a regular daily schedule. Undergraduates sometimes use all-nighters and other short-term strategies when they are sprinting to make a deadline. But research is more of a marathon than a sprint and requires a more steady approach to avoid burnout.
- Don't binge on your work just because you are making good progress that day. Put it down and get some sleep, and pick it up tomorrow. If you over-do it today, you are likely to crash in the days or weeks ahead, and you won't be better off than with a steady schedule. Conversely, if you stop before you are done, it is often easy and fun to pick up your work the next day so you can keep going.
- Make friends with your classmates and other peers. These are the people who best understand the challenges you are going through[2], and who will be there to celebrate your successes. My grad-school friends were instrumental in making my Ph.D. a positive experience, and seeing these friends at conferences and meetings is one of the most rewarding parts of my business travel.
- Get familiar with, and utilize, your campus's resources for physical health and mental health.

[1] Schedule and protect time for work too, but work time should leave some time for the rest of life.

[2] Don't worry that you are burdening your classmates by sharing challenges. It is important to normalize that everybody has struggles, and you should assume that most of your classmates are experiencing similar struggles.

2 Find role models and mentors

You will likely not get an orientation where someone gives you a list of what exactly to do to be successful. The way to learn this information is to find people who can point the way.

2.1 Role models

Role models are people who are effective in areas you want to succeed in. They may be productive students, junior faculty members, thought leaders, or people with work-life balance. Your first task is to identify these people. Ideally, you can observe your role model up close and ask them questions, but people you have learned about through biographies or other means can also be role models. Your second task is to identify what characteristics seem to make them effective, relative to the characteristics of others. Do they have a particular way of choosing their priorities? Do they have particular schedules or habits when performing their work? You need not copy anybody exactly, but the exercise of studying the habits and behaviors that make people successful is a great way to learn how to model your own life.

2.2 Mentors

Mentors are people who can provide you personal guidance concerning specific situations and challenges that you may be facing. Mentoring can happen with many different levels of intensity. It may be a senior person at another institution that you ask a question to once a year. Or it may be a peer with slightly more experience than you, with whom you check in weekly. It may be somebody with whom you have an official 'mentor' relationship, or it may be a trusted person you occasionally reach out to. Regardless of the level of interaction, keep in mind that mentoring is not a one-way street. Be respectful of your mentor's time–be prepared with thoughtful questions when you reach out, and make sure to share with your mentor what successes you have achieved and how their advice has helped you. You will be surprised by the number of people willing to share some advice, but in return, make sure they can enjoy the knowledge that their effort had a positive impact.

Also, your advisor is a mentor, so make sure to utilize their expertise. Ask them on occasion about their advice on other professional topics, and about how they navigated the early stages of their career. Most advisors are happy to share their knowledge, and when my advisees ask me other questions, I take it as a positive sign that they are thoughtful about their career.

3 Always be thinking

Unlike a job related to physical labor or more rote mental activities, your productivity as a scholar is strongly related to the level of curiosity and creativity you deploy in thinking about your research problems. My role models are often insatiably curious and relentless in continuing to examine their problems. Some examples of things you can do to build this habit:

- Ask lots of questions. If you read a paper by somebody you know (such as a classmate or professor), ask them questions afterwards to confirm your understanding or learn more about their thinking on the topic. If you go to a seminar, raise your hand and ask a question. If you see somebody at a meeting whose work you have studied, go up to them to say thanks, and ask more about their work.

- Keep a binder or other collection of ideas and try to make entries frequently. This binder is for brainstorming, so your goal is to generate lots of ideas. Don't worry about screening for the best ideas until later.
- Keep a notebook by your bed, and notes file in your phone, to capture random thoughts that come to you. And transfer them later into your binder.
- Keep your research questions in the back of your head (during your commute, when you are exercising, etc.). I sometimes think about research questions while running, and the exertion clears my mind enough that I come up with fresh ideas.
- In classes and meetings, think about how you could apply the ideas you are learning to your research. These connections are an important source of research ideas, and also enable you to listen to presentations more critically.
- Look for opportunities for new ideas. Organize and attend seminars, go to local meetings and workshops, and subscribe to publication alerts from journals related to your work.

4 Thoughtfully focus your research efforts

From Section 3, you will generate many ideas that may or may not be worth pursuing. Many of my discussions with graduate students are about prioritizing ideas to pursue. You cannot evaluate any particular idea in a vacuum; you can only assess it relative to other ideas that you might spend your time on instead.

Once you have your list of candidate ideas to pursue, consider the strengths and weaknesses of each. My first screening considers these three factors associated with worthwhile research efforts:

1. The probability of success is high.
2. If the effort is successful, the benefit will be large.
3. The amount of work is small in proportion to the expected benefit.

If you can find an idea that satisfies all three, congratulations! Usually, however, there are tradeoffs to be made. You might have an easy idea that you know will work, but it isn't very important. Or you might have an idea that would be groundbreaking if it worked, but it will take a lot of effort and may not work.

In contrast, the following factors are problematic if they describe an idea you are considering:

- I feel comfortable playing with this topic, but I have not established whether it is novel or whether anybody cares about it.
- I have not yet figured out whether the outcome of this effort will lead to any interesting insight[3].
- I noticed this issue as an aside when I was working on my main research, so I pursued it because it was fresh on my mind. I haven't thought about whether it is better or worse than other opportunities.

[3]It pays to think through ahead of time: What is my hypothesis that I am testing? If this activity turns out how I expect, what will I learn? If this activity doesn't turn out how I expect, what will I learn? If you can't state a testable hypothesis, or you can't figure out what you will learn from the work, you should abandon the idea or at least think it through further before starting work.

That said, it is fine to occasionally try things just for the fun of it. You'll be motivated and creative if you are sincerely interested in it. And you may find unique links back to your practical problems.

5 Set measurable goals, and measure them

A unique aspect of research as a profession is that progress is sometimes not apparent from day to day. Additionally, some tasks take much longer than you might expect. For example, a grad student who writes more than one paper a year is very productive, but completing a paper can take hundreds of steps, and sometimes take years. So while you are writing a paper, it is easy to feel like you are treading water and will never get finished. With this in mind, you can navigate the situation with a few tips:

First, have big goals in mind, but break those goals down into the specific next steps that you need to take. 'Finish my paper' or 'find a job' are excellent big-picture goals, but they don't help you plan what to do this week. You need to break 'finish my paper' down into 'write a draft outline,' 'produce the figures for the example calculation,' etc. You need to break 'find a job' down into 'update my CV,' 'schedule a meeting with the career center,' 'get feedback on my research statement,' etc. Then you have specific tasks that you can prioritize and can mark off (with great satisfaction) once they are done. One book I have found very useful on this topic is Getting Things Done (Allen, 2015).

Second, track your performance. Tasks like writing paper outlines or producing figures often take more time than you expect. So if you set a goal of finishing your outline this week, check next week to make sure you did it. And if you didn't make it, reflect on that. Was it because the task was much harder than you had anticipated? If so, keep that in mind for next time. Was it because you weren't as focused as you should have been, or because you spent too much time on details that weren't important? If so, make some plans to adjust your work for next time. This assessment is essential both to figure out how to productively make progress, and because research jobs require you to forecast timelines (when you commit to writing a paper for a conference, or when you prepare a budget for a proposal), so you need a realistic view of how long things take. Assessment does not require a complicated or time-consuming process; just make sure that you have some system to regularly check on your progress.

Third, find people to share and measure your goals with. This could be your advisor or a group of classmates. The act of being accountable to others is very motivating, and empirical studies have shown that people who share and evaluate goals with others are more productive.

6 Get feedback

You can get tunnel vision after focusing on a problem for weeks or months, so make sure to obtain outside perspectives. Talk to people about your work, and get them to ask you tough questions. Human nature is such that many people will initially give you a polite 'looks good!' rather than being honest that they had a hard time understanding part of your work. That is not helpful and is not evidence that your work is done. So be sincere and persistent in asking them to point out tricky parts and give suggestions. Once people see that you genuinely want constructive criticism, they will open up a bit more.

When you give presentations, make sure to remember what questions people ask you, so you can preemptively address them in the future. There is a progression in obtaining feedback. First, when you write or create a presentation, you will spot gaps and address them. Second, when your

advisor sees your work, they will raise questions for you to address. Third, when you present or share paper drafts with fellow students, they will raise questions. Finally, when you present at a conference, publish a paper, or interview for a job, you will have sorted out the tricky parts during the earlier stages, so that you are delivering polished and clear work.

7 Make good impressions

The value of a researcher largely lies in the way that other experts perceive them and their work. And junior faculty are explicitly measured for tenure based on the perceptions of experts. Their perceptions will be primarily based on the value of your research, but being reliable, collaborative, and a generally pleasant person are also huge factors. There are so many talented students in the world that I am not interested in dealing with or helping unprofessional or unreliable students. Some tips to keep in mind:

- Share with others, and look for opportunities to make others look good. Post some code to a public repository or take a few minutes to teach a younger student about a technique you know well. It rarely costs you much, but is rewarding and is a natural fit with your mission of disseminating knowledge. Someday others will be happy to return the favor. To make this tangible: consider these Advice documents that I am sharing, and the software and data on my website. Would you say that they advance my mission of disseminating knowledge? Would you say that their existence enhances my professional reputation? I believe that the answers to both are 'yes,' and encourage you to share some things as well.

- Complete your work on time. People trust colleagues that they know will deliver on commitments. If you don't think you can finish on time, speak up at the outset, rather than staying silent and delivering work late. I have a list of people in my head who I know are always late in submitting their contributions to projects. I have another list of people in my head who always deliver on time and deliver great work. When I have the choice, I always work with the latter people and avoid the former people. So think about where you will stand in these mental lists that your colleagues keep.

- Do 10% more than was asked of you. The world is full of people who do what they are told, but people who exceed expectations are quickly spotted and always appreciated.

- Arrive at meetings on time, appropriately dressed, and prepared. Meetings, especially with people you haven't met, are informal interviews, and you never know when someone you meet will be in a position to offer you a job or other professional help.

8 Embrace occasional rejection

Do not take rejection as evidence that you are not qualified to be doing your job. A complete absence of rejection is evidence that you are not taking risks.

As a personal example, I had to delay my start of graduate school for a year after being rejected by several top choices, and receiving no financial aid from others. And I have many proposals rejected each year, including some that I have spent months or years preparing. You can read some of my rejections at `https://web.stanford.edu/~bakerjw/advice/Negative_proposal_comments.pdf`

9 Conclusions

A concept underlying much of the above is Grit (Duckworth et al., 2007). Graduate research certainly requires prerequisite knowledge and training, but many people have or can achieve that. The unique aspect of research (relative to undergraduate coursework or many jobs) is that there is much less structure to your work, there is less clarity as to how quickly you are making progress, and there are many setbacks along the way. The most productive scholars are comfortable with that ambiguity, and persistent and focused in the face of challenges while pursuing a long-term goal of producing and disseminating new knowledge. It is a strange and sometimes-discouraging endeavor, but for people who love solving puzzles and making discoveries, the effort can be well worth it.

References

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