

Letters to the Editor

Doing research as a student



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Over the years, I have worked in a variety of research groups and learnt from great scientists with different approaches. There is no 10-step plan for success in research, particularly when you are researching the unknown! But there are many paths to leading a rewarding career in scientific research and adopting practices from successful scientists has helped me navigate my own career. Here, I compile some of the advice on doing research that I explicitly or implicitly received during my undergraduate, graduate, postdoctoral, and faculty years and use to this day. This is the same advice I give my own students. Some of these points are fairly obvious; others I wish I had implemented earlier in my own career. There are also articles in the scientific literature on doing research and publishing and presenting your results that are great reads; one example is cited here <https://doi.org/10.1002/adma.200400767>.

1. *Own your project.* The most successful researchers feel true ownership over their work. Even as a student, you are not working for your advisor—you are working for yourself. Dedicate yourself to your project so that you ultimately teach your advisor and become the real authority on the subject (which feels great!)

2. *Research is rarely glamorous.* You must enjoy the scientific process and not just the end goals. My field of synthetic chemistry takes enormous amounts of labor and patience and the same is true for many other fields. In my world, a week-long reaction may not yield any product and some projects are abandoned after years of fruitless research. Your happiness should not be associated too tightly with the success of your research. As a graduate student, despite working very hard, I did not get publishable results until my 4th year—but I still enjoyed synthesis—and that told me (more clearly than my later successes) that this is my field.

3. *Don't put all your eggs in one basket.* Working on more than one project mitigates the risks that are inherent in research.

4. *“Will this project work; who will care?”* is a great question to ask before starting a new project. Balancing risk and reward can be tricky, and there are many twists and turns in any research project, but especially the second part of this question helps you focus on what is worth pursuing.

5. *Write a little every day.* Don't wait until you have completed your project to start writing your paper. In fact, the act of writing the paper will tell you what more experiments to run to strengthen your arguments. Don't wait until you have a large chunk of time to devote to your paper. Even if you write a sentence one day and delete it the next day, you are still refining your paper. This process always keeps your research in your thoughts and the best ideas come to you when you are thinking about research casually and not really “at work”.

6. *Figures matter more than words.* Take the time to make the most beautiful figures you can. Very few people will actually read your paper! But many more will look at the figures. A good figure can compel a reader to keep reading.

7. *Become an authority on past work.* Providing correct historical context for your work, appropriately citing the pioneering reports (which are sometimes hard to find) are signs of good scholarship and it will elevate your paper and your scientific reputation.

8. *Write the paper that you want to read.* For the most impact, make your paper accessible to a general readership. Scientific articles need not be boring or difficult to read. Write your paper for a newcomer to your field and take the time to explain anything that you had to learn yourself.

9. *Every talk is a job talk.* Practice talking about your research (even if you are only talking to yourself!) Few things are more important than giving a good talk. There is no point in doing research if you cannot explain its significance to others, regardless of their background. Learn how to give a compelling longer talk and how to give a quick (2-5 minute) description of your research. Many schools and companies use short online interviews for screening students/postdocs/job applicants and impressing the search committee in a few minutes is very important for being selected for the next round.

10. *It is never too early to start thinking about your independent research.* If you are interested in an academic career, don't wait until you feel ready (you never feel ready; you just take one step at a time). It is next to impossible to find a great research idea under time pressure, so start dreaming early! Think about the combination of experiences that makes your perspective and skills unique/unusual and devise a research project that caters to your strengths.