

March 2009 - Research Tip

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My discipline happens to be physics, and my research area is more tailored towards experimental physics. However, I hope the research tips I share in this article can be applied to many other disciplines.

First of all, I want to reiterate one research tip that has probably already been mentioned by a few other professors: ***Stay connected to the professional community***. I find myself connected to the professional community through the following channels:

(a) *Go to professional conferences*

This is probably the most efficient way to stay connected. At conferences, I get a chance to present my own work as well as listen to other researchers' presentations. Often times, good research ideas are inspired from questions that I am asked or discussion with other conference participants. Collaboration between different groups sometimes starts from a good discussion in a conference.

(b) *Publish research results in peer reviewed journals*

Publishing in a peer reviewed journal is not always an easy task, at least in my discipline - Physics. My previous paper took about a year to get published. I encountered a tough reviewer. It was really persistence and patience that eventually got me through. Difficult as it might appear to be sometimes, I found publishing to be absolutely necessary. After all, journals are where other researchers can find out what my research group is up to.

(c) *Be a reviewer for journals*

Occasionally, I receive emails from editors of certain professional journals requesting me to review a manuscript of a paper. This is completely voluntary. Given the fact that I am already busy enough with teaching, advising students and doing research, why would I still do it? I consider this as my service to the professional community. Although the reviewing takes some time (being a serious reviewer, I usually read the manuscript two or three times before I start to write a referee's report), there are of course some immeasurable benefits that come along with it. For one, I get to see the submitter's work first. If the work is close enough to mine, often times I get some inspiration from it.

(d) *Collaborate with other researchers*

Everybody probably knows the importance of research collaboration. It helps distribute the work load as well as utilize the specialty of all research collaborators. I found this extremely important to me. Sometimes I have an idea but do not have time to do it myself or cannot find anyone to carry it out in my research group. I would then bring it up to my collaborator who has more graduate students. Most of the time, my collaborator will find a way to help investigate the subject.

As graduate physics program is not yet available in the department of applied science and technology at Saint Peter's College, majority of the time, I encounter doing research with undergraduate students. That brings me to my second point: ***Conduct research with undergraduate students.***

Junior and senior students are probably more prepared to work in a research project. However, it doesn't mean they are always motivated enough to work hard. Sometimes, I would rather have a motivated freshman/sophomore rather a lazy junior/senior. Undergraduate students often have busy schedules during their first two years. However, that does not stop them from getting into research projects early. As a recent example, I identified Luan To, an honor student who declared physics as his major in his freshman year. After a mutual evaluation period, he agreed to work as my student research assistant on a project in my lab for the rest of his college years. We made a general research plan and even set long term and short term goals for him. At the beginning, I always tried to spend some time with him in the lab whenever he had spare time, teaching him bits and pieces (I consider this as teaching in a non-traditional environment, though sometimes it may look like an apprenticeship). As soon as he was comfortable enough with the project, I let him to proceed by himself and checked his progress periodically. I also tried to provide whatever assistance he needed to make sure a smooth research experience for him. He told me multiple times that he really enjoyed the excitement when a new phenomenon was observed. Of all the things that I can give to the students, what could be better than the exciting moments?

To summarize, I believe conducting research effectively with undergraduate students can be approached from the following aspects:

- (a) Identify a good student (often from the lower level courses)
- (b) Make a detailed research plan with him/her, set short term and long term goals
- (c) Give him/her freedom to do the research
- (d) Advise him/her periodically and provide assistance whenever needed
- (e) Encourage him/her to present in student conferences or even professional conferences; provide financial support for their trips whenever it is possible
- (f) Be generous with including his/her name in publications; this might really mean something in their application to graduate schools