**Research with Undergraduates: Tips and Suggestions for Research Mentors**

*(some tips modified from SUNY Buffalo faculty list)*

**Recruiting Students**

* You will likely recruit students from undergraduate classes that you teach, especially if you teach undergraduates regularly. If your department values undergraduate research and you have trouble finding students, try recruiting more broadly: advertise on bulletin boards and/or your department webpage, and make announcements at geology clubs and classes. Display your research on posters in the department. This can be an effective recruitment tool by showing uninitiated students what their possibilities may be.
* Consider which level(s) of students you will accept into your group. Has the student had prior research experiences, or are they research novices? First-year students can perform research, but may not be ready contribute to a project that requires knowledge in classes they have not taken yet.
* Consider why a student wants to participate in research and what s/he hopes to gain from the experience. Find out what the student’s post-graduation plans are (e.g., graduate school, specialized training, or employment) and how the research experience could help them.
* Consider a trial period (2-3 weeks) for undergraduate researchers during which you and/or your other research students work closely with the undergraduate student to determine if s/he will be an asset to your research group, prior to committing to working with that student.

**Designing Projects**

* Help students develop interesting research projects that will provide tangible and meaningful results. If they've already agreed to work with you, then they may already have some topic preferences, but both of you need to design a project that will draw on the students' interests (what do they want to do, and what do they want to get out of this by the end?).
* Students will work on projects they can get excited about. If you demand a large amount of time from them, be sure the student will work on something they are also interested in. Consider what upper-level courses they have taken and are currently taking.
* Provide appropriate guidance and positive reinforcement to help students develop a sense of ownership of the research. Students should be responsible for all phases of the project from design to presentation. Trust that eager students and motivated mentors are going to find many interesting things that demand analysis, explanation, and context. Be flexible and open to opportunities.
* Consider whether or not it is appropriate to mentor a student that wants to conduct work outside your area of expertise, and engage other faculty if needed. Be aware of the potential pitfalls of mentoring projects outside your own research program if department promotion and tenure expectations include advancement of your research.
* Students can be encouraged to write (or help write) proposals for their research to different funding sources (intramural and extramural) and this can be valuable experience to focus their thoughts for the research.
* You may want a student to be trained in a piece of equipment or in a technique, but not perform a complete research project. Be sure that is clearly conveyed.

**Communication and Expectations**

* Clearly state expectations. If course credit and/or a grade is being given, agree upon what will be required. A written record is best, and your department may have a policy. This goes both ways: faculty need to clearly state their expectations of students, and students need to be clear about what they expect from faculty (in as much as students can be made comfortable to do so).
* Consider a research contract. However, be aware that the wording in some of these contracts can be discouraging to students.
* Set regular meeting times to talk about progress and any issues related to the project. Consider how long these meeting should be (once a week for one hour, or once a week for an entire afternoon?) While electronic communication is a good way to handle minor questions and issues, it should not replace face-to-face meetings. Consider what repercussions are appropriate if the student misses these meetings.
* Consider if you will pay your student and/or if the student will earn academic credit for the research. In either of these cases, you may find your expectations increase compared to when they are volunteering their time.
* Let your student know when you will be available. Be responsive to your student’s needs, but it is not necessary to be available all the time. If you have significant commitments, tell your student up front so that they can decide if you will be sufficiently available to meet their needs.
* Know that students may need official training in lab safety and research ethics. Check to see if this is required (note that this may be required by your department, university, and/or funding agencies, such as NSF).

**Time Management**

* Work with the student to establish a timeline for the project. Write the timeline in a calendar displayed in the lab or office. Prioritize for the student different aspects of the project.
* Determine how much the student can devote to the project each week, and consider if the research is taking place during the summer or the academic year.
* Recognize that undergraduate students have demands on their time, and may have difficulty prioritizing long-term research goals with shorter-term assignments, exams, etc. Determine early on how these issues will be handled.

**Mentoring Style**

* Think about best practices in mentoring (from your own mentors or others’) and try to adopt those. Think about worst practices and avoid those; just because you survived your research advisor does not mean everyone could have.
* Don’t assume your students understand everything you are saying, even if they are nodding their heads. Try to probe their level of understanding without making them feel like you think they don’t know anything. For example, when reviewing journal articles, have a student present sections of a paper to you, so you can both be sure that the student both understands the paper and can distill the relevant and important points from the paper.
* Be friendly and helpful but remain the authority and expert. Facebook is a great social networking tool to showcase field research and scientific discussions, but can make students feel uncomfortable. Your department may have rules regarding this. Limit your social profile and keep work separate from personal business.
* Peer mentoring can be facilitated by establishing a research group in which student participants are a team under a single umbrella, but with each student conducting their own project. An ideal group consists of students at different stages of their research.
* Students will make mistakes. Expect that they will break equipment, blow experiments, fail to complete a critical step in a process, or have other problems. Consider your reaction and the consequence if something does go wrong. Supervise important steps in projects to avoid some of these problems.
* Employ a "trust but verify" approach to student note-taking, documentation, data collection and archiving, and presentation preparation. Read written work carefully, and have frank discussions about research ethics, including plagiarism and data manipulation.

**Publishing**

* Encourage and support your student to disseminate the results of their research/scholarly/creative project at meetings and conferences. Showcasing students’ results within your department and academic building by hanging student posters and photographs (including photographs taken when they were presenting their research and/or creative activity).
* Consider where data will be stored and who can have access to it. If the student will work on a computer, set up a clearly organized filing system under their name so you can access the data, papers, thesis or other written work, etc at any time.
* Set up guidelines early on for publication of results. Consider your department’s values for first-authored and student-authored publications.

**Your turn…space for ideas and notes:**

* Your institution: What is the institutional climate for undergraduate research at your institution? What can you take advantage of now? What institutional challenges do you face? What questions do you need to find answers to soon? Who will you ask?
* Your research program: What projects do you have in which you can involve undergraduates? At what level are these projects? How will you balance moving your research forward with undergraduate students’ needs and goals?
* Your mentoring philosophy: What characterizes a good undergraduate research mentor? How are the needs of undergraduate students different from graduate student needs, and how will you address this?

**Additional Resources**

Adviser, Teacher, Role-Model, Friend: On being a mentor to students in science and engineering National Academy of Sciences, National Academy of Engineering, Institute of Medicine **1997** National Academy Press (full text available online)

SERC webpages:

Undergraduate research: <http://serc.carleton.edu/introgeo/studentresearch/index.html>

Collaborating with students: <http://serc.carleton.edu/NAGTWorkshops/earlycareer/research/students.html#thoughts>