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2. Getting Started: The unwritten rules of doing research

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4. Best Practices in Mentoring
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Case Studies

Case Study 1
Ian, an undergraduate student, is excited about the new data he just obtained from a recent observing run at a telescope. These are his first data, and he wants to reduce and analyze them himself. His mentor respects his desire to do the work independently, and so decides not to interfere unless asked. Four weeks go by without a word from Ian, and the mentor decides to check in. Ian says that everything is going fine, and he'll have results to show the mentor shortly. A week later he proudly asks to set up an appointment to show his mentor the results. After only five minutes the mentor knows that Ian has not reduced the data correctly, and in fact will have to do most of the work again. The mentor points out the mistakes. As Ian leaves it is clear that he is crestfallen. After a week, the mentor hasn't heard a word from him. The mentor wonders if Ian was given too much freedom and ponders what to do now.

Case Study 2
I started working with Amy on her senior thesis this semester, and I just can’t seem to get along with her! I told her at the beginning of the semester that I thought we should have weekly meetings to talk about her progress, and she agreed. At our next meeting, I asked Amy to run through a list of the things she’d accomplished that week. She had no notes and seemed pretty unprepared for talking about her work in the level of detail that I expected. She’s been canceling most of our meetings at the last minute—either she doesn’t feel well, or she suddenly remembers an assignment for another class that’s due the next day! I know that she’s doing the work, because at the few meetings she keeps, she has a lot to say—but her progress on this project is very uneven, both in time taken and in quality, and I’m often forced to suggest that she redo crucial pieces. I fear these critical meetings leave Amy demoralized and less interested in accepting guidance from me, but I don’t know how else to get her to understand that she needs my help.

Case Study 3
You have recently explained a complicated computational technique to Josh, your mentee. As you were explaining, Josh nodded the entire time as if he understood every word you were saying. When you were finished with your explanation, you asked Josh if he had any questions. He said no. Just to make sure, you asked Josh if everything was clear. He said yes. Three days later you asked Josh how his work using this technique was going and he told you he hasn’t started because he does not understand the technique.

What can you do in the future to make sure your mentee understands what you are
Your mentee, Sascha, is enthusiastic about your research project and seems confident in his ability to be resourceful. Every day when he gets back from the instrument room, you ask him how it went, and he says —Good,— without giving much detail. You occasionally check his log book and everything seems to be going well, and so it doesn’t occur to you to question Sascha about the nitty-gritty details of his day.

After several weeks pass, you realize that your data were collected not exactly the way you wanted. After some probing, you realize that the instrument was not taking data over the full range of operation. You asked Sascha why he didn’t record data over the full range and he said the power supply fuse blew every time he tried to take data at the higher ranges. “I looked for a different power supply, but I couldn’t find one,” he told you, “And so I just stopped taking data a point just below the one that caused the fuse to blow.” You’re frustrated because you could have had the instrument repaired if you had only known.

I was thrilled when Rongying, my undergraduate mentee, won a fellowship for an independent summer research project. Her small fellowship project was directly related to my thesis project, and so I was optimistic about getting great data from her, as well as being able to complete my project because I had an extra pair of helping hands. My advisor did not have funds to pay for any assistance for my project, and so if Rongying had not gotten a fellowship, I would have had to split my project between two summer field seasons because the workload was not possible with only me working on it.

One day, Rongying asked why she wasn’t paid extra for the hours she worked on my project outside of her fellowship research. I told her that most undergraduates who receive fellowships are expected to work on both their mentor’s and their own projects as part of the training, which was true in my department. Rongying said that her fellowship requirements state that her stipend was only to be used for work on her own project. I didn’t know what to say or how to handle issues of money, and so I just told her to talk to my advisor about it.
Case Study Discussion Questions

1. **Student’s view:** What went wrong from the student’s perspective? Were there any “unwritten rules” that the student didn’t understand?

2. **Mentor’s view:** If you were the mentor, what would you do next? Are there any steps the mentor could take to try to avoid this problem in the future?

3. **Underlying problem:** What is the underlying problem in this situation? What similar problems have you faced, and what strategies have you used to avoid or resolve the issue?
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Tips for successful mentoring

1. **Establish a communication plan:** Establishing clear expectations with your student about how often you will meet and how you would like them to contact you is an important first step in making sure that the relationship goes smoothly. Students are often intimidated by professors; setting clear expectations about when and how they should ask questions makes them more likely to seek help when they need it.

2. **Teach students resilience:** For many students, the inevitable setbacks in the research/creative process will be the first time that they have tried something and had it fail. Model for students how to manage setbacks and help them to be persistent.

3. **Expose students to the full research/creative process:** Even if students will only be completing a portion of the research process, it is important that they understand the overall context of the project and how their individual work fits into the larger research process.

4. **Address professional development:** Surveys of student researchers have found that they often report that some of the most important benefits of undergraduate research are related to professional development: networking opportunities, experience working in a professional setting, gaining experience in public speaking, etc. Discuss career goals with your student to ensure that these goals are being met.

5. **Have the end in mind:** Establishing clear objectives for your students (in terms of student learning, research productivity, professional development, etc.) will aid in communication and allow you to be strategic in your investment of time. It will also allow you to evaluate the effectiveness of different mentoring practices.
Undergraduate Research Contract

**Directions:** Students should fill out this research contract in consultation with their mentor. The purpose of the contract is to clearly establish expectations, goals, and communication plans between student researchers and their mentors; this contract should facilitate that conversation. Fill it out at the beginning of the research period, then return to the contract at the end of the research and discuss the student’s progress (particularly for section 4).

1. General Information

   - Student name____________________
   - Mentor name_____________________
   - Semester/Year____________________

2. Expectations

   - **Communication plan:** What is the best way for the student to contact the mentor with questions? Will there be regular check-in meetings? If so, how often?

   - How many hours per week, on average, should the student spend working on the project?

   - If the student is enrolled in credit hours for this research, how will the final grade be determined?

   - Does the student need to get the mentor's permission before presenting this research at a conference and/or submitting it for publication? Y/N
• Which, if any, of the following KU resources should the student use to complete the project? (circle all that apply)
  o Make an appointment with the Writing Center for feedback on drafts of paper.
  o Complete one of the online CITI tutorials (human subjects, responsible conduct of research, etc.) offered through KU's Office of Research.
  o Research Integrity training/approval
  o Complete safety trainings on Blackboard offered through KU's Department of Environment, Health, & Safety.
  o Departmental or lab resources
  o View website and/or attend a workshop offered through the Center for Undergraduate Research about presenting your research at a conference.
  o Consult with a KU subject librarian for assistance finding sources.
  o Other _________________________________.

3. Research Milestones

Identify several tasks that the student should aim to accomplish as s/he moves toward completing the project, including a tentative schedule. Be sure to include any product, such as a paper, creative work, or presentation, that the student is expected to complete by the end of the semester. (Add more fields as needed).

Example Research Milestones:

Identify six articles to read.

Successfully clone gene of interest.

Administer survey.

Submit proposal to present at Undergraduate Research Symposium.

Turn in the first draft for a final paper.

• Milestone 1:
  o Target completion date:

• Milestone 2:
  o Target completion date:
Milestone 3:
  o Target completion date:

Milestone 4:
  o Target completion date:

4. Student Outcomes

Identify several outcomes (skills, knowledge, professional development, etc.) that are important for the student to develop through the completion of this project. Use these questions to get you started: What does the student want to get out of this research experience? What does the mentor want the student to get out of the experience?

Example skills outcomes:

  Can identify relevant sources from library databases.

  Learn to operate a thermocycler to complete PCR.

  Can successfully use Final Cut Pro to edit my film.

Example content knowledge outcomes:

  Be able to compare/contrast 3 different scholars' interpretations of "Brave New World."

  Be able to summarize the latest research about the causes of depression among the elderly.

  Be able to explain and understand the concepts behind the PCR technique and its application to the lab's work.

Example professional development outcomes:

  To show my artwork in a gallery.

  To attend a professional conference.

  To create a writing sample/portfolio for graduate school applications.

  To help me decide on my career options.
• **Outcome 1:**
  o Student level at start of project: *(no experience, beginning, adequate, advanced)*
  o Student level at end of project: *(no experience, beginning, adequate, advanced)*

• **Outcome 2:**
  o Student level at start of project: *(no experience, beginning, adequate, advanced)*
  o Student level at end of project: *(no experience, beginning, adequate, advanced)*

• **Outcome 3:**
  o Student level at start of project: *(no experience, beginning, adequate, advanced)*
  o Student level at end of project: *(no experience, beginning, adequate, advanced)*

• **Outcome 4:**
  o Student level at start of project: *(no experience, beginning, adequate, advanced)*
  o Student level at end of project: *(no experience, beginning, adequate, advanced)*

Student signature: _______________________________________________________________

Mentor signature: _______________________________________________________________
Mentoring Resources

1. Institutional Resources:
   a. When possible, direct your mentees to institutional resources and save your time for discipline-specific mentoring. Check for the availability of:
      • Libraries
      • Writing Centers
      • Undergraduate Research Centers
      • Health & Safety training

2. Online resources:
   a. KU Center for Undergraduate Research: www.ugresearch.ku.edu
      • Online video tutorials: “How to Read a Journal Article,” “Poster Presentation Basics,” etc.; https://ugresearch.ku.edu/student/resources
      • Online research contracts: https://ugresearch.ku.edu/mentor/resources
   b. WEB GURU: http://www.webguru.neu.edu/
      • An online guide that explains many aspects of research in the sciences to an undergraduate audience.
        • Includes pages on:
          a. Time management
          b. Lab notebooks
   c. Collaborative Institutional Training Initiative (CITI)
      Tutorials: https://www.citiprogram.org/
      • Offers a variety of tutorials that students can take and print off a certificate of completion.
        • Trainings include:
          a. Human subjects research
          b. Responsible conduct of research

3. Further Readings:
   a. Presentation today adapted from:
      • “How to Mentor Undergraduate Researchers,” 2010, Temple et al., a publication of the Council on Undergraduate Research.
• “Science in Solution: The Impact of Undergraduate Research on Student Learning,” 2010, David Lopatto.

b. Ideas and materials for activities to do with undergraduate mentees:
• “Entering Research: A facilitator’s manual; workshops for students beginning research in science,” 2010, Branchaw et al.