

Supplemental Material

CBE—Life Sciences Education

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**Finding a Fit: Biological Science Doctoral Students' Selection of
a Principal Investigator and Research Laboratory**

Supplemental Material

Student Interview Protocol - Year 1

Path to Ph.D.

1. I'd like to learn about when, how, and why you became interested in pursuing a Ph.D. degree. **When you reflect on your experiences before you began this program:**
 - a. At what point in your life did you start thinking about pursuing a Ph.D.?
 - b. What prompted your interest in a Ph.D.?
 - c. What prompted your interest in biology?
 - d. How did you decide to earn a Ph.D. in your specialty area?
 - e. What professional opportunities do you think are available for those who graduate with a Ph.D. in your specialty area?
 - f. What do you plan to do once you graduate?

2. **When you were considering biology Ph.D. programs in your specialty area:**
 - a. Describe the biology program characteristics that you considered, and why.
 - b. Describe the institutional/university characteristics that you considered, and why.
 - c. Describe any other factors did you considered (e.g., cost of living, distance to family or friends, regional/local culture, climate, etc.)
 - d. How many programs did you apply to?
 - e. How did you ultimately select this specific program?
 - f. Is there anything else you'd like to share with me about your consideration of the different institutions/universities, or of the different biology programs in your subspecialty area?

Prior Research Experiences and Current Self-Assessment

3. How did you become interested in learning how to conduct research? {ask of all }

If prior research experience is reported at the high school, undergraduate, previous graduate school, or industry level on the demographic survey:

a. Describe your research experience in high school (if any)

- i. Describe how you got involved in that research experience
- ii. With whom did you collaborate in that research experience?
- iii. What types of research activities did you engage in during this research experience?

b. Describe your research experience as an undergraduate student (if any)

- i. Describe how you got involved in that research experience
- ii. With whom did you collaborate in that research experience?
- iii. What types of research activities did you engage in during this research experience?

c. Describe your previous research experience as graduate student (if any)

- i. Describe how you got involved in that research experience
- ii. With whom did you collaborate in that research experience?
- iii. What types of research activities did you engage in during this research experience?

d. Describe your research experience in industry (if any)

- i. Describe how you got involved in that research experience
- ii. With whom did you collaborate in that research experience?
- iii. What types of research activities did you engage in during this research experience?

If no prior research experiences reported on demographic survey:

*Describe the research activities you anticipate undertaking in this program.

4. Describe yourself as a researcher at this point.

- a. What research skills do you consider to be your strongest, and why?
- b. What research skills could you improve upon, and why?
- c. If I gave you a camera and asked you to take a picture that best represented who you are as a researcher right now, what would that picture look like?

5. Describe the elements of a good research project.

6. Perception of Faculty Roles/Responsibilities and Student Roles/Responsibilities

- a. What is the role of a faculty advisor in a Ph.D. program?
- b. What expectations do you have of a faculty Ph.D. advisor?
- c. What are your expectations based on? (e.g., peer input, prior graduate work, program handbook descriptions)
- d. Do you have a doctoral faculty advisor now?
 - i. If not, how will you obtain one?
 - ii. If so, how was that relationship established?
- e. What are your roles and responsibilities as a doctoral student? That is, what should and what does your current/future doctoral faculty advisor expect from you?

7. Perceptions of Sources of Support beyond the Ph.D. Advisor

- a. On a day-to-day basis, who do you turn to for support as you proceed through this program, and why?
- b. What forms of support do you look for?
- c. What forms of support do you receive?

Student Interview Protocol - Year 2

1. Writing Sample Vignette

Have you participated in writing an abstract or paper for presentation or publication this past academic year? If not, why not?

If so, tell me about how this piece was developed and your role in its development. How was your role determined? What kind of tasks did you do to contribute? What tasks did you want to do but didn't do, and why? How was the authorship order determined? How do you feel about your experience in contributing to this piece? Was your experience on this project typical (the way it is on other paper/projects?) If this project is different, what is different about it, and why?

2. Laboratory Rotation

You've been in your permanent lab for a while. Think back to your experiences as you were deciding on a permanent lab to join. What was the process for joining a permanent lab? What was it like going through this process? How do you feel about the process? What advice about this process would you give to Ph.D. students in your area who will start their program this fall?

3. Laboratory Life

So far, have the expectations you developed during rotations about your permanent lab been met? Why or why not? In general, what kind of research does your permanent lab conduct? On what research project in your lab do you spend most of your time? How is this research project funded? (e.g., federal grant, industry partnership). What is your role in contributing to this research? How was your role assigned? What impact do you feel the source of funding has on your research, opportunities, and lab responsibilities? How is credit assigned for work accomplished in your lab? How are you valued in your lab?

4. PI and Peer Relationships

What is your relationship like with your PI at this point? What have been important milestones this past year in your relationship with your PI? What is your relationship like with your lab mates at this point? What has been the biggest academic challenge you faced this past academic year? Who helped you through this challenge? (if not PI, ask: Was your PI aware of this challenge? If so, how was he/she involved?)

5. Are there groups, clubs, or other similar organizations that you have engaged with that you view as a source of support or encouragement for you as a doctoral student?

6. Work-Life Balance

How do you balance your doctoral program responsibilities with all your other responsibilities (e.g., family, friends, hobbies, personal time)? Do you talk to your PI or lab mates about balancing these responsibilities? What is their approach/advice?

7. Post-Ph.D. Plans

Professionally, what do you plan to do once you graduate? If these plans have changed since you started your doctoral program, what led to this change?

8. Is there anything else you would like to share with me about your doctoral experience in the past year?

Factors Considered by Doctoral Students in Laboratory-based Disciplines in Selecting a Principal Investigator and Research Laboratory

This study finds that doctoral students in laboratory-based disciplines considered these factors and asked these questions when selecting a Principal Investigator (PI):

- (1) Relationship with the PI. Does my relationship with the PI have strong potential to remain positive and productive over time?
- (2) PI mentoring style. Do I want a direct, 'hands-on' mentoring style, an indirect, more student-independent 'hands-off' style, or an 'ad hoc' style in which PIs are available to me as needed?
- (3) PI professional stability. Does the PI have funding to support me as a researcher? Does the PI have tenure, and if not, is the PI likely to be tenured?

Students considered these factors and asked these questions when selecting a research laboratory (lab) to join:

- (1) Lab Mate Fit. Do my relationships with my potential future lab mates have strong potential to remain positive and productive over time?
- (2) Research Project Fit. Am I interested in the type of research project I would likely conduct if I joined this lab? Does it align with my anticipated graduation timeline and long-term career goals?

Implications to Consider:

- (1) Given that students will likely spend at least four years closely interacting with their PI, it is in students' best interest to consider all three PI-related factors (relationship, mentoring style, and professional stability). We note that funding is a critical component of professional stability.
- (2) Given that students will likely spend a significant amount of time with lab mates who will shape their lab experiences for better or worse, it is in students' best interest to carefully and candidly consider their fit with intended lab mates as closely as they do their fit with their intended PI.
- (3) Understanding what factors students consider in making PI selection decisions may help PIs recruit and secure students who are well matched to their own disposition, mentoring styles, and research interests.
- (4) Programs can use these findings to provide forums for candid and beneficial discussions between and among students and PIs around the PI and lab selection process. Essentially, the more candor and care given by and to all parties in this selection process, the more likely all parties will benefit both in the short- and long-term. We especially note that it is

important for PIs to be candid about funding available to support students joining their lab; students may feel awkward asking about it and/or may not realize how consequential it is to their success.