AC 2011-2054: SIGNIFICANT FACTORS IN SUCCESSFULLY MATCHING STUDENTS TO BIOMEDICAL ENGINEERING RESEARCH LABORATORIES

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Significant factors in successfully matching students to biomedical engineering research laboratories

We see increasing demand from undergraduates for research experiences and a parallel increase in college and university interest in promoting research-based undergraduate education. Undergraduate research experiences have been shown to provide valuable skills such as the ability to "explain, present, discuss, and defend [one's] work to peers, advisors, and other faculty" [1], understanding how scientists and engineers work on real problems, analyzing and interpreting data, and learning lab techniques [2].

As undergraduate programs and institutions grow, it becomes difficult to successfully match students to laboratories. Apart from identifying labs that are willing to accept undergraduates, successful matching requires an as yet unknown combination of interests, skills, implicit or explicit mindsets, and demographic factors. In a single department these factors may be known to a limited extent of both the labs and the undergraduate applicants. With enough prior experience one might intuit a good student-lab combination. However, for large departments, diverse educational programs, or entire institutions, it is impossible to hand-match students to labs because our knowledge of all possible combinations is limited. We are aware of instances of students being referred to long lists of laboratories to self-identify research opportunities. This process is not only time consuming, but does not guarantee that students will find a lab that will be a good match between their and the principal investigator's expectations.

The objective of this study was therefore to determine whether student or laboratory characteristics, or a combination of both, appreciably predict the outcome of student-lab pairings. The ultimate goal is to generate an algorithm and online tool for self-service matching of students to labs on an institutional scale.

Prospective factors mediating successful lab matches

As mentioned above, we begin with a dearth of information on the important factors for predicting success in the setting of a laboratory team. Previous studies on effective team formation have cited knowledge, skills, and abilities (KSAs) as important predictor for developing teams [3-5]. Technical skills are assumed to be a basic requirement of all team-members and therefore less pertinent to team formation. These previous studies therefore place a much heavier emphasis on social and interpersonal skills. It is important to recognize, though, that these studies all originated in the context of human resources management, not scientific laboratories. While interpersonal skills are undoubtedly valuable in a laboratory setting, technical knowledge and skills – those the student can provide, or those that they can learn – may be more important in this context than credited in previous studies. We focused on these given the ease with which KSA data can be collected, and additionally looked at demographic factors that have anecdotal effects on student-mentor pairings.

We divided KSAs into two conceptual categories – technical skills/knowledge, and areas of research interest. This study was limited to BME labs, and the majority of KSAs were accordingly BME-centric. Technical skills include making chemical solutions, cell culture, computer programming, computer modeling, electronics, working with live animals, performing animal surgery, and microscopy. Research areas include tissue engineering, medical imaging, human physiology, biochemistry/proteins, genetics/DNA, medical devices, drug development, cell signaling, cardiovascular, cancer, and mechanics.

Interviewing BME undergraduates provided clues to additional factors that may play a role in successful matching. The interviews consisted of a free-response conversation between one of 16 randomly selected undergraduates and an undergraduate interviewer regarding factors they would consider in choosing a research lab. Free responses that were common to at least two individuals are shown in Table 1.

Table 1: Data obtained from interviewing sixteen BME undergraduates in Fall 2009.

10	Want to be able to do hands-on research
6	The lab environment is the most important factor
5	Dislike labs related to computer programming or computational modeling
5	Want to work in a wet lab as oppose to a dry lab
5	Want a lab that has flexible scheduling
5	Want graduate students to help if the lab director is not available for assistance
3	Want to know if a position is available
3	Social events associated with the lab

We used these interviews, and anecdotal reports from faculty, to develop three additional categories of factors that might impact student success in laboratory settings – demographics and basic requirements, laboratory atmosphere, and miscellaneous preferences.

Basic requirements included the academic year of the student, the students' grade point average and any threshold requirement the lab may set in that regard, majors and minors, the time commitment expected, and what compensation (money, academic credit, or nothing) is offered or desired, and when (fall, spring, or summer) research may be performed.

Atmosphere describes the lab environment. This includes lab size, whether there are lab meetings or social get-togethers, and lab type – that is, research-based versus design-based, wet lab versus dry lab, and whether the labs usually undertake individual or team projects. It also includes who does the undergraduate research mentoring for a given lab – the principal investigator, graduate students, lab managers, or post-doctoral fellows.

Miscellaneous factors include the likelihood of a student publishing their work, organization of the workspace environment, and the use of computer programming.

Surveys

Two surveys were developed – one for labs (appendix A) and another for students (appendix B). The two surveys included matching questions for each predictive factor so that a correlate score for each student-lab pairing could be calculated. The student survey was anonymous, and both surveys were approved by the Social and Behavioral Sciences IRB at the University of Virginia.

In addition to the predictive factors described in the previous section, students were asked to recount their history of lab experiences – in which lab they worked, and whether each experience was "successful," which we clarified as "a good match for you."

Surveys were distributed to seventeen different labs within the Department of Biomedical Engineering at the University of Virginia, and to the second, third, and fourth year BME students.

All seventeen lab surveys were completed and returned. On the student side, 91 surveys were returned. Of these, 27 were from 2nd Years, 35 were from 3rd Years, and 24 were from 4th Years. See Table 2 for an overview.

Table 2: Overview of survey responses.

Number of surveys collected		91
Female:Male	with prior lab experience	1.5:1
	without prior lab experience	0.8:1
Number (and percentage) of:	Biomedical engineering (BME) students with reported lab experiences	48 (52.7%)
	reported lab experiences	66
	non-BME lab experiences	19 (28.8%)
	BME-only lab experiences	47 (71.2%)
Number (and percentage) of BME students with:	only one reported lab experience	31 (64.6%)
	two reported lab experiences	16 (33.3%)
	three reported lab experiences	1 (2.1%)
Mean number of hours worked during academic semesters		10.3 ± 6.3
Number (and percentage) of:	paid lab experiences	25 (37.9%)
	lab experiences for credit	29 (43.9%)
	volunteer lab experiences	26 (39.4%)
	lab experiences in the fall	40 (60.6%)
	lab experiences in the spring	44 (66.7%)
	lab experiences in the summer	32 (48.5%)
	lab experiences spanning at least two semesters	34 (51.5%)
Number of reported successful experiences (self-declared)		58 (87.9%)
Implied successful experiences (did not move to another lab)		42 (63.6%)

Formulating a model predicting the likelihood of success in a lab

For the KSAs, the correlate scores for individual student-lab matches were computed by taking the product of the lab and student responses to matched KSAs and summing the products. Negative correlations were mapped to a value of -1, correlations between 1 and 16 inclusive were mapped to a value of 1, and correlations above 16 were mapped to a value of 2, where 16 was the mean score for all student-lab pairings. For the multiple choice questions regarding lab preferences, if the lab answer to a question agreed with the student's, a value of 1 assigned while disagreement was coded as 0.

Data were analyzed using SPSS software. Binary logistic regression (equation 1, below) was used to identify the most important predictors for the probability of successful matching to a laboratory.

$$P = \frac{1}{1 + e^{-(c + B_1 x_1 + B_2 x_2 + \cdots B_n x_n)}} \qquad \text{Eq. 1}$$

P signifies the probability of having a "successful" lab experience, c is a constant, x_n are possible factors, and B_n their associated regression coefficients in the logistic equation. $B>0$ indicates the factor will increase the odds of the success, and likewise $B<0$ indicates the factor will decrease the odds. Logistic regression has been used previously in exploring the effects of prior affiliations on team formation [6], behavior [7], and performance [8], to cite only a few recent examples.

Interestingly, characteristics about the labs alone, such as popularity (i.e., the number of students who worked in a given lab) were not statistically significant predictors of self-reported success and failure. Similarly most characteristics of the students alone, such as gender, GPA, and academic year, were not significant, though more female than male students reported having laboratory experiences. The most significant predictors were the correlate KSA scores between labs and what students wanted to learn ($p = 0.14$), student preference to work alone or in teams ($p = 0.14$), and student desire to work with live animals or perform animal surgery ($p = 0.16$). Each of these makes intuitive sense in a BME lab setting. A better match between laboratory and student interests, at any educational level, lends itself to success. Given that most research laboratory settings are inherently team-based, a desire to work in teams rather than alone also makes sense. That a student desire to work with live animals was a *negative* predictor may either (a) reflect the fact that the majority of undergraduate students in BME labs do not get to work directly with live animals, or (b) be related to an unidentified social or moral dimensions of lab work.

Note that working with or performing surgery on animals was also a component in the correlate score of KSAs for matching students to specific labs.

Redefining “success”

The high p values above can be attributed to the relatively small sample size of 66 lab experiences and only 7 of those experiences were reported as being unsuccessful. This seemed at odds with anecdotal evidence that relatively few students stick with a research project in the long term. We inferred that students were interpreting success as “Did I like what I did?”, “Did I have a valuable learning experience?”, or “Did I gain any new skills?” Principal investigators, in contrast, may apply a more stringent standard for success – “Did the student return for multiple semesters, and as a consequence were they productive?”

We repeated our analysis with the assumption that students who didn’t return to a lab in a subsequent term (for any reason) actually experienced an *unsuccessful* match, regardless of any explicit declaration to the contrary. By this assumption 23 unsuccessful experiences out of 65 were inferred. Logistic regression on these data increased our statistical confidence that correlate KSAs and a desire to work in teams are important predictive factors, and highlighted four additional factors that may be important: student academic year, student GPA, lab size preferences, and the correlate score for mentor preferences (i.e. who in the lab does the mentoring, versus by whom the student wants to be mentored). Logistic regression was applied to combinations of these predictors to find the four best models (Table 3).

Note that these models are phenomenological and meant only for predictive purposes. Further, the regression coefficients are non-orthogonal; there is thus no unique, verifiable combination of predictive factors that go into the model. The models can and were, however, validated for their predictive ability.

Table 3: Logistic regression *B* coefficient values for our four prospective models predicting the probability *P* of successful student-laboratory matching.

Model	**constant**	**KSAT**	**Team**	**Animals**	**Year**	**GPA**	**Mentor**	**Size**
1	-2.6	1.8 p=0.07	3.0 p=0.07	-4.1 p=0.07				
2	-25.5	1.9 p=0.04	4.6 p=0.08		2.6 p=0.10	3.0 p=0.11	-0.14 p=0.16	
3	-16.6	1.63 p=0.05	3.6 p=0.09		1.8 p=0.13	1.9 p=0.16		-1.0 p=0.40
4	-12.2	2.3 p=0.08	4.4 p=0.09	-4.0 p=0.09	1.9 p=0.09			

Model validation

To validate our models, an independent dataset of student experiences was collected. These were obtained in an online survey administered to the same cohort of biomedical engineering students as before. To increase our response rate, we restricted our questions to the significant factors identified from the first survey. The 97 survey responses were tabulated to determine the likelihood of having successful experiences in one of the BME labs.

As discussed in the previous section, in our first survey students were asked broadly whether each lab experience was a “good match”. Perhaps as a result the responses were overwhelmingly positive. In our validation survey we provided three different metrics for success for each lab experience (Table 4). The first two metrics require the student to reflect on the knowledge and experience gained in a lab (Enjoy) and whether it matched their preconceptions prior to entering (Expectations). The third metric (Return) more closely aligns to a principal investigator’s view of success – would the student consider returning to the lab? By this metric, an intuitively more realistic 22.7% of matches were reported as unsuccessful.

Table 4: The second student survey: the reported outcome of lab experiences using student-centric and lab-centric metrics for success.

Measures of successful lab experiences	Reported **successful** by this metric	Reported **unsuccessful** by this metric
Did you enjoy what you did and learned in this lab? **[Enjoy]**	85	12
Were you satisfied with what you learned and did in this lab? **[Expectations]**	86	11
Would you consider returning to this lab? **[Return]**	75	22

One-tailed binomial tests were used to establish the proportion of predictions that the models can correctly make. We arbitrarily chose a test proportion of ~75% correct success predictions by a given metric. Table 5 highlights the models and metrics that meet statistical significance at

$p<0.1$. Note that all the models predict *successful* lab experiences by any of the three metrics. However, only certain models could predict the student-centered success metrics for all lab experiences, both successful and unsuccessful.

In fact, *unsuccessful* lab matches by student-centered metrics were only significant at a test proportion of 63%. *None* of the models successfully predict successful and unsuccessful lab matches by the lab-centered metric of the student wanting to return to the lab for additional semesters.

Table 5: Efficacy of model-success pairs. A: Model efficacy for predicting successful lab experiences. B: Model efficacy for predicting both successful and unsuccessful lab experiences. Blue text highlights pairs that can correctly predict successful and unsuccessful lab experiences at least 63 percent of the time.

Model →	Success metric	**A** Observed proportion of correct predictions regarding *successful* lab experiences	*p*	**B** Observed proportion of correct predictions regarding *all* lab experiences	*p*
1	Enjoy	0.84 (53 out of 63)	0.04	0.74 (53 out of 72)	0.04
	Expectations	0.86 (55 out of 64)	0.02	0.78 (56 out of 72)	0.01
	Return	0.84 (46 out of 55)	0.07	0.65 (47 out of 72)	0.39
2	Enjoy	0.84 (53 out of 63)	0.04	0.76 (55 out of 72)	0.01
	Expectations	0.84 (54 out of 64)	0.04	0.78 (56 out of 72)	0.01
	Return	0.82 (45 out of 55)	0.12	0.65 (47 out of 72)	0.39
3	Enjoy	0.79 (50 out of 63)	0.21	0.72 (52 out of 72)	0.07
	Expectations	0.80 (51 out of 64)	0.19	0.74 (53 out of 72)	0.04
	Return	0.78 (43 out of 55)	0.30	0.64 (46 out of 72)	0.49
4	Enjoy	0.81 (51 out of 63)	0.13	0.71 (51 out of 72)	0.10
	Expectations	0.83 (53 out of 64)	0.07	0.75 (54 out of 72)	0.02
	Return	0.80 (44 out of 55)	0.20	0.63 (45 out of 72)	0.51

Conclusions

Our objective was to determine whether student or laboratory characteristics, or a combination of both, appreciably predict the outcome of specific student-lab pairings. We find that correlated student-desired and lab-provided knowledge, skills, and abilities, along with a student preference for working as part of a team, were both significant positive predictors. The former is equivalent in conversational terms to asking a student "What kind of work or research interests you?" and matching them to laboratories that are focused on those sorts of techniques or questions. While this is a simple and familiar approach to most of us, particularly at the graduate level, many undergraduates find it difficult to express their research interests outside the context of a list of possibilities. Further, its efficacy in constructing viable working teams has been questioned [9].

As an example case, one of the authors of this study received while writing this report an email from a student saying "I really want to work in a lab. Do you know anyone who will have me?" without any regard to what *kind* of lab. It is heartening to know that this simple measure of student-lab congruence has predictive ability for such students.

The influence of a student wanting to work as part of a team instead of individually, while perhaps not surprising, is quite interesting. It has been found that working in teams is related to "real-world" achievement metrics in a BME major design experience [10]. It is possible that a social mindset is just as important to success as the act of working within a team structure.

Together, these two factors, along with *not* wanting to work with animals (a puzzling observation) were found to correctly predict at least 74% of successful lab experiences and at least 63% of unsuccessful experiences by student-centered metrics. We also found that for students who reported an unsuccessful lab match, we could identify one or more labs where the model would have predicted a much higher probability of success. We therefore feel that we are fast approaching a point where we can implement an online tool for self-service matching of students to labs, first on a departmental scale, and with additional data on a pan-disciplinary, institutional scale.

Unfortunately we were not able to predict success by a lab- or investigator-centered metric of the student returning to the lab in subsequent semesters. This is often considered a prerequisite for true undergraduate productivity in a lab. The list of possible predictive factors with which we began this project was apparently of little use by this metric. However, some insights into possible lab-centered metrics were gleaned from free-response sections of the laboratory questionnaires. When asked what qualities they had observed of students where the lab match was successful, more than two principal investigators independently responded with "a motivation to do research" (7 responses) and "curiosity" (4 responses). Each of these is a mindset of the individual student rather than a correlate of a lab-specific quality. Mindsets such as "motivation" are notoriously difficult to assess, but recent advances in measuring implicit cognition [11] (attitudes, biases, and beliefs of which the individual is not consciously aware) may allow us to better measure mindsets that influence *persistence* in laboratory teams and persistence in science [12].

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Appendix A – Laboratory Survey

What is your name? ______________________

In what building is your lab located? ______________________

Section 1. Lab Requirements

Does your lab have projects that require the responsible student to be a particular gender? [Yes - Male] [Yes - Female] [No]

What academic years are allowed to *begin* working in your lab? (circle all that apply) [1^{st} Year] [2^{nd}] [3^{rd}] [4^{th}] [Grad Student]

How important is a student's major in your consideration of whether or not to take them in your lab?
[Very Important] [Important] [Neutral] [Somewhat Important] [Not Important]
- ➔ What major(s) do you prefer? ______________________
- ➔ In addition, what minor(s) do you prefer if any? ________________________

Is a resume required in order to apply? [Yes] [No]

Do you have a GPA requirement? [Yes] [No]
- ➔ If so, what is the lowest GPA you will accept? _______

What is the minimum number of hours per week that you expect undergraduates to put in? ______ (a range is acceptable)

What academic terms and for what compensation do you allow undergraduates to work in your lab? (check all that apply)

	Fall Semester	Spring Semester	Summer
for Credit			
for Pay			
as Volunteer			

Section 2. Lab Information

How likely are undergraduates able to publish what they have accomplished in your lab?
[Highly Likely] [Likely] [Neutral] [Somewhat Likely] [Not Likely]

How many post-docs are in your lab? ____ Graduate Students? _____ Undergraduates? ______
- ➔ Does your lab have a lab manager? [Yes] [No]

Who in your lab does the most mentoring of undergraduates? [PI] [Post-docs] [Lab Manager] [Grad Students] [No one]

What is the typical age of the person who normally mentors students in your lab? ________________
- ➔ What is the average age of your …graduate students? ______ ...post-docs? ______

How organized is your laboratory? [Extremely Organized] [Organized] [Average] [Cluttered] [Extremely Cluttered]
- ➔ How often do you clean your laboratory? [Daily] [Every other day] [Weekly] [Bi-weekly] [Monthly] [Less than monthly]

How often do members of your lab get together socially outside of work?
[Daily] [Every other day] [Weekly] [Bi-weekly] [Monthly] [Never]

Does your lab work in teams or as individuals? [Team] [Individual] [Both]
- ➔ If both, how many teams are there? _____ How many projects are run by individuals? _____

How much computer programming is required of a typical student in your lab?
[None] [Some] [Moderate] [Decent Amount] [Daily]

Would you consider your lab to be primarily a wet lab or dry lab? [Wet Lab] [Dry Lab]

Which one does your lab fall into? [mostly Design based] [mostly Research based] [Both]
- ➔ If both, how much of is dedicated to design? _____%

How often does your lab hold lab meetings? [Daily] [Every 2-3 Days] [Every 3-4 Days] [Weekly] [Bi-weekly] [Never]

What skills, abilities, knowledge, and techniques are used by students in your lab? Circle one ranking per row.

Tissue engineering	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Medical imaging	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Biochemistry/Proteins	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Genetics/DNA	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Human physiology	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Medical devices	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Drug development	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Physics: Mechanics	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Cell signaling	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Cancer	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Cardiovascular	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Making chemical solutions	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Cell culture	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Computer programming	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Computer Modeling	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Electronics	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Live animals/Animal surgery	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]
Microscopy	[Used or needed by all]	[Used or needed by some]	[Not used or needed at all]

If not listed above, please use the space below to state which skills, abilities, knowledge and techniques are important to your lab

What kind of trends do you see in students that have been successful matches to your lab, and likewise those that were not successful matches to your lab?

Appendix B – Student Survey

Section 1: Please tell us in which UVa labs have you worked, how much time you committed, during what semesters, whether you were paid, and whether you considered them to be "successful" experiences, meaning a good match for you? We understand that your answer does not reflect the quality of the lab or the people in the lab, but rather on whether it was a good match for you specifically. Do not include one-day "lab shadowing" experiences. *If you have not worked in a lab at UVa, write "None" in the first line, and circle how you would want to be compensated (pay, credit, volunteer) and when you would be willing to work (fall, spring, summer).*

	Department	Head of lab	Hours/week	Paid, for credit, or volunteer?	When during the year?	Successful?
Lab 1				[Paid] [Credit] [Volunteer]	[Fall] [Spring] [Summer]	[Yes] [No]
Lab 2				[Paid] [Credit] [Volunteer]	[Fall] [Spring] [Summer]	[Yes] [No]
Lab 3				[Paid] [Credit] [Volunteer]	[Fall] [Spring] [Summer]	[Yes] [No]

Section 2: In the table below, circle "Had" for each skill, ability, or domain of knowledge that you had *before* entering each of the labs you listed above. Similarly, circle "Wanted" to indicate skills, abilities, and knowledge were you looking to acquire in a lab experience. Finally, circle "Used" to indicate a skill, ability, or domain of knowledge that you actually learned or used in that lab experience. If you wanted to avoid a particular activity, circle "Avoid." <u>*If you have not worked in a lab at UVa, please circle in the first column the techniques you would like to learn/use, and "Avoid" for any that you would not be willing to use or learn.*</u>

Please circle your choices

Skills, Abilities, knowledge, and techniques		*Laboratory* **1**	*Laboratory* **2**	*Laboratory* **3**
Making chemical solutions	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Tissue engineering	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Cell culture	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Computer programming	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Medical imaging	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Biochemistry/Proteins	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Computer Modeling	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Genetics/DNA	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Electronics	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Human physiology	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Medical devices	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Drug development	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Physics: mechanics	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Live animals/surgery	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Cell signaling	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Cancer	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Microscopy	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]
Cardiovascular	[Avoid]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]	[Had] [Wanted] [Used]

If there are other skills, abilities, knowledge or techniques that you had, wanted, or avoided, please list them below:

Section 3: Please answer these questions about your laboratory preferences.

For each academic term listed below, check what kinds of compensation you would find acceptable. Check all that apply.

	Fall Semester	Spring Semester	Summer
For credit			
For pay			
Volunteer			

Would you mind working in lab located more than ten minutes away from MR5?
[Yes] [No]

What lab size would you prefer?
[Smaller (less than 5 people)] [Larger (more than 5 people)]

Would you prefer to be mentored or advised by a:
[Graduate student] [Post-doctoral student] [Head of the lab (P.I.)] [No preference] [None]

Would you be most comfortable having a mentor who is older by:
[1-3 years] [3-7 years] [More than 7 years] [No preference]

Would you prefer to work individually or in a team?
[Individual] Team: [with a graduate student] [with a post-doctoral student] [with other undergraduates]

Would you prefer a lab that is: [Design-based] [Research-based] [Both]

How do you feel about the tidiness of a lab? Would you be most comfortable with a lab that is:
[Extremely organized] [Organized] [Neutral] [Cluttered] [Extremely cluttered]

How do you feel about publishing any research done in the lab?
[Publishing is my main goal] [Publishing is preferable, but not required] [No preference]

How often would you agree to conduct literature reviews?
[Daily] [Every other day] [Weekly] [Bi-weekly] [Monthly]

If you have worked in a lab, did you send a resume to the lab? [Yes] [No]

If you have worked in a lab, did your lab have occasional social get-togethers? Was that important to you?

If you have particular research interests, please describe them.

Is the availability/accessibility of a mentor important to you?

Section 4: Demographic information

(Optional) What is your gender: [Male] [Female]

In which academic year are you? [1st Year] [2nd Year] [3rd Year] [4th Year]

I am majoring in (or intending to major in): ______________________. I am minoring or intending to minor in: ______________________________

(Optional) My cumulative GPA is : [below 2.0] [2.0-3.0] [3.0-3.5] [3.5-4.0]