



Feeling Like a Grad Student: A Survey of Undergraduate Researchers' Expectations and Experiences

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Introduction

Participating in faculty-mentored research as an undergraduate can have a profound impact on students' decisions about graduate school. Students are more likely to persevere in challenging undergraduate coursework when they have support from faculty mentors and can see the connections between classroom knowledge and their research activities.¹⁻³ This effect can be particularly powerful for students from populations that are historically underrepresented in STEM (Science, Technology, Engineering, Math) fields.⁴⁻⁷ Undergraduates who participate in research also gain opportunities to meet graduate students and assist with graduate-level research projects, which can help students build the necessary academic and research skills to succeed in future graduate studies.⁸⁻¹⁰ Perhaps most importantly, engaging in research often helps undergraduates to clarify their academic interests and career ambitions, and make decisions about whether attending graduate school will help them reach their goals.^{11,12}

Michigan State University (MSU) offers a variety of summer research programs for undergraduates, including residential and non-residential options in STEM, SBE (Social, Behavioral, and Economic Sciences) and liberal arts disciplines. Most of these programs operate under a common, 10-week calendar that begins in mid-May and ends in late July with a campus-wide research forum where students can present the results of their summer work with MSU faculty. The Summer 2012 research forum included more than 260 undergraduates from nearly 60 institutions, who worked with more than 200 faculty from 58 departments and 12 colleges within Michigan State University. In addition to engaging in full-time, faculty-mentored research, these undergraduates have opportunities for personal and professional development, and participate in a variety of outreach and networking opportunities across campus. The summer research programs also assist students in developing application materials for graduate schools, such as academic resumes and personal statements.

Survey Instruments and Methodology

We conducted pre- and post-experience surveys of undergraduate researchers participating in summer research programs at Michigan State University during Summer 2012. The pre-experience survey was deployed in the first week of the 10-week summer program, and gathered information about students' background, preparation for research, and their expectations of what the summer experience would involve. The pre-experience survey included a self-assessment of students' skills and strengths and asked about students' reasons for participating in undergraduate research, the nature of their early communications with their research mentor, and their post-graduation plans (graduate school, career, etc.). Appendix A lists all of the questions included in the pre-experience survey.

The post-experience survey was deployed at the end of July, at the conclusion of students' summer research experience. This second survey repeated several of the questions from the pre-

experience survey, which allowed us to compare students' expectations with their experiences, and look for changes in students' self-assessments of research skills over the 10-week program. Students were also asked about their interactions with their research mentors and the personal and professional outcomes of their summer experience. Appendix B includes a copy of the post-experience survey questions.

About 160 undergraduate researchers were targeted for this study; they were identified by their participation in University-sponsored summer research programs that focused on STEM or SBE disciplines. 74 students (37%) responded to the pre-experience survey, and 56 students (44%) completed the post-experience survey. Within those responses, 36 students completed both the pre- and post-experience surveys. This group of 36 students included 19 who indicated that this summer was their first experience in undergraduate research, while the remaining 17 students had previous research experience. Several of the survey questions were analyzed in the context of these "novice" and "experienced" groups of students, to identify any differences that might correlate to students' prior experience with research. Students' interactions with their mentors and research groups were analyzed by gender, ethnicity and students' year in school.

Self-Assessment of Students' Preparation and Skills

On both the pre- and post-experience surveys, students were asked to conduct a self-assessment of their preparation for research in their specific area or discipline, using a five-point Likert scale (Strongly Agree=1, Agree=2, Neutral=3, Disagree=4, Strongly Disagree=5). 74 students answered this question on the pre-experience survey, and 55 students responded to this set of questions in the post-experience survey. Table 1 summarizes the number and percentages of students on the pre- and post-experience surveys who agreed or strongly agreed with each of the statements about their preparation for research in their area. Overall, students' levels of agreement with each statement increased between the pre- and post-experience surveys, suggesting that the summer research experience helped at least some students increase their research skills. This general trend is consistent with previous research that demonstrates gains in knowledge and abilities through undergraduate research,^{7,9,12,13} although it should be noted that only 36 students took both surveys (Table 1 includes data for all respondents).

Students were also asked on both the pre- and post-experience surveys to assess broader academic, research and interpersonal skills. This set of questions was answered by 74 students on the pre-experience survey, and by 54 students on the post-survey. The "Agree" and "Strongly Agree" responses to each question were collapsed, as summarized by Table 1. Again, these data must be interpreted in light of the partial overlap (36 students) between the pre- and post-surveys. However, we were pleased to see an increase from 64% (pre-survey) to 81% (post-survey) in students who indicated that they had a basic understanding of the graduate school application process. This result is consistent with previous research indicating that participating in undergraduate research can be a strong recruitment tool for graduate programs.^{2,11,12} 100% of students on both the pre- and post-surveys reported that they were able to work effectively both on their own and in groups, and 96% of respondents in both surveys reported that they were able to work through challenges or obstacles.

Table 1: Self-Assessment of Preparation for Research, Pre- and Post-Experience

I possess a basic understanding of	Pre-Survey (n=74)		Post-Survey (n=55)	
	SA/Agree	%	SA/Agree	%
the process of research in this area	66	89%	53	96%
the research literature in this area	57	77%	45	81%
the research skills/lab techniques in this area	60	81%	52	95%

Table 2: Self-Assessment of Knowledge, Abilities and Skills, Pre- and Post-Experience

	Pre-Survey (n=74)		Post-Survey (n=54)	
	SA/Agree	%	SA/Agree	%
I have strong leadership skills.	58	78%	48	89%
I have strong interpersonal (social) skills.	59	79%	43	80%
I am able to develop a professional network.	60	81%	47	87%
I am able to work effectively with others.	74	100%	54	100%
I am able to work effectively on my own.	74	100%	54	100%
I am able to manage my time effectively.	66	89%	50	93%
I am able to work through obstacles or challenges.	71	96%	52	96%
I am able to write a research abstract.	58	78%	48	89%
I am able to create a research poster.	57	77%	45	83%
I am able to give an oral research presentation.	54	73%	37	69%
I possess a basic understanding of the graduate school application process.	47	64%	44	81%
I possess a basic understanding of how to do statistical analysis of research data.	53	72%	42	78%
I possess a basic understanding of how to interpret research data.	64	86%	49	91%
I possess a basic understanding of how to apply research data.	61	82%	48	89%
I am able to communicate technical information to people within my discipline.	64	86%	50	93%
I am able to communicate technical information to people outside my discipline.	58	78%	47	87%

Comparing Students' Expectations versus Experiences

The pre-survey asked students to indicate whether or not they thought they would participate in specific research-related tasks and activities, and in the post-survey students were given the same list of items and asked to indicate whether or not they actually completed or participated in each task. In both surveys, students were asked to select all of the activities/tasks that applied; Table 3 summarizes the number of students who selected each item in the pre- and post-experience surveys, grouping responses from “novice” and “experienced” students.

Chi-square tests for independence (or Fisher's Exact Test when expected counts were too low) were used to examine the differences in expected and observed counts between novice and experienced undergraduate researchers. Their answers on both the pre- and post-survey were analyzed and compared to see if there were differences between the novice and experienced students related to their perceived expectations and actual experiences. On the pre-survey, the only activity that indicated significance was “statistical analysis,” $\chi^2(1, n = 36) = 9.168, p = .002$, $\phi = -.560$ (with Yates Continuity Correction), although the significance was very small. On the post-survey, none of the task statements yielded significant association between the tasks the students engaged in and their experience level.

Table 3: Expectations (Pre-Test) and Experiences (Post-Test) of Undergraduate Research, by Students' Experience Level

	Novice Students (n=19)		Experienced Students (n=17)	
	Pre	Post	Pre	Post
Defining a research problem	12	12	7	10
Developing a research hypothesis	5	7	8	8
Designing an experiment	12	12	11	12
Gathering data	17	16	17	15
Analyzing data	18	17	16	16
Modeling data	12	8	12	10
Writing about research process/results	16	14	12	13
Presenting research process/results	14	13	13	15
Working in a research group or team	12	13	14	16
Work in a laboratory setting	16	15	14	15
Work in an office setting	9	8	7	7
Field work outside of a laboratory or office setting	2	2	3	1
Developing/using databases	6	3	7	5
Developing/using spreadsheets	14	13	12	15
Developing websites	2	4	1	1
Developing computer programs	4	2	2	1
Computational analysis	7	3	8	8
Statistical analysis	5	6	14	10

The 36 students who chose to complete both surveys are just a subset of the approximately 160 students who were invited to participate in this research project, and certainly the relatively small sample set warrants caution in interpreting the results. Based on the available data, both novice and experienced students seemed to have good expectations of what their summer research experience would entail, given the close matches between students' reported expectations (pre-survey) and actual experiences (post-survey). These data suggest that the program organizers and research mentors were successful in communicating expectations to students early in the summer. More importantly, we know from previous research that a mismatch between students' expectations and experiences can result in negative impressions about research.^{9,14,15} So, determining that participants in this subgroup, who completed both the pre- and post-experience surveys, had a good match between expectations and experiences can inform the interpretation of other data from this study.

Students' Interactions with Research Mentors

In the post-experience survey, students were asked about their interactions with their primary research mentor. In responding to these questions, students were asked to consider the individual they considered to be their primary research mentor – the person who provided the most day-to-day support and mentoring. 56 students completed the post-experience survey, and 51% indicated that their primary research mentor was a faculty member. 31% of respondents had a graduate student serve as their primary research mentor, with the remaining students mentored by post-doctoral scholars or other research staff. More than half of the students reported interacting with their primary research mentor between 1 and 10 hours per week, on average.

Extensive research has examined the importance of mentoring relationships in undergraduate research experiences, and the characteristics of successful mentoring relationships.^{5,16-19} The post-experience survey examined several characteristics of the mentoring relationship by asking students to indicate their level of agreement with a series of statements about their primary research mentor, using a five-point Likert scale (Strongly Agree=1, Agree=2, Neutral=3, Disagree=4, Strongly Disagree=5).

An independent-samples t-test was conducted to compare students' reported interactions with their mentor based on gender (male; female), ethnicity (Caucasian; underrepresented and international), and year in school (freshman or sophomore; junior or senior).

Gender

There was no significant difference between males and females on these questions.

Ethnicity

When examining ethnicity, there was only a significant difference in the scores for "My research mentor answered my questions" when the students were divided into Caucasian ($M = 1.23$, $SD = .490$) and underrepresented and international ($M = 1.64$, $SD = .674$; $t(44) = -2.194$, $p = .0349$ (two-tailed)). The magnitude of the differences in the means (mean difference = $-.408$, 95% CI: $-.782$ to $-.033$) was moderate (eta squared = $.099$). We found it interesting that the Caucasian

students agreed somewhat more strongly with the statement about research mentors answering their questions than did the students from underrepresented and international populations; however, it was not clear what factors may have contributed to this result.

Student Class Level

Grouping students' responses by their year in school (freshman or sophomore; junior or senior) yielded the most significant differences in scores. Table 4 summarizes students' post-experience survey assessments of their mentor interactions, grouped by students' year in school. Broadly, these frequencies indicate that the older students (juniors and seniors) found significantly more value in those types of mentor interactions that encouraged self-sufficiency and allowed students to work more independently. Both groups reported frequent, significant interactions between the mentors and student researchers; the remainder of this section discusses these findings in more detail.

Table 4: Students' Valuation of Mentor Interactions, by Students' Year in School

My primary research mentor....	Freshman and Sophomore		Junior and Senior	
	SA / Agree	%	SA / Agree	%
set expectations for me	7	15%	32	68%
listened to me	9	19%	35	75%
answered my questions	9	20%	35	76%
checked in with me regularly	8	17%	31	67%
helped me get started on my project	9	20%	32	70%
provided constructive feedback	9	20%	35	76%
encouraged me to offer my own ideas	8	18%	32	71%
helped me become more self-sufficient as a researcher	7	15%	35	76%
helped me understand how my project contributes to the academic discipline	10	22%	32	70%
helped me understand how my project contributes to society	9	20%	32	70%
helped me establish professional networks	7	15%	25	57%
talked with me about future career plans and/or graduate school options	5	11%	26	57%

The older students (juniors and seniors) expressed stronger agreement with the statement “My primary research mentor helped me get started on my project” ($M = 1.29$, $SD = .710$; $t(44) = 2.344$, $p = .024$ (two-tailed)) than did the freshman and sophomores ($M = 1.91$, $SD = .944$). The magnitude of difference in the means (mean difference = .623, 95% CI: .087 to 1.159) was moderate (eta squared = .111). It is not clear whether the older students were simply more aware of their mentors' efforts to help them start their research projects, or if there was disparity in the guidance provided to older and younger students.

The post-experience survey results revealed a similar difference for the statement “My primary research mentor provided constructive feedback as my project progressed” between freshmen or sophomores ($M = 2.00$, $SD = .894$) and juniors or seniors ($M = 1.29$, $SD = .4587$; $t(44) = 3.522$, $p = .001$ (two-tailed)). The mean difference was .714 with a 95% confidence interval ranging from .714 to .203. The eta squared statistic (.220) indicated a large effect size. Again, it is possible that the older students were simply more aware of their mentors’ constructive feedback in the context of a research environment, while younger students have less experience receiving and interpreting feedback that is provided outside the traditional classroom-assignment-exam academic structure.

In a similar vein, the older students agreed more strongly when asked “My research mentor helped me to become more self-sufficient as a researcher.” The difference between freshmen or sophomores ($M = 2.27$, $SD = 1.104$) and juniors or seniors ($M = 1.23$, $SD = .426$; $t(10.951) = 3.067$, $p = .011$ (two-tailed)) yielded a large effect size (eta squared = .176; mean difference = 1.044, 95% CI: .294 to 1.794). This result is not unexpected, given that students with more experience in research and coursework are better equipped to succeed when given additional responsibility and autonomy by their mentors.

Lastly, there was a significant difference for “My primary research mentor helped me to understand how my project contributes to society” between freshmen and sophomores ($M = 2.18$, $SD = 1.250$) and juniors and seniors ($M = 1.51$, $SD = .742$; $t(44) = 2.185$, $p = .034$ (two-tailed)). The magnitude of the differences in the means (mean difference = .668, 95% CI: .052 to 1.283) was moderate (eta squared = .098). It seems likely that part of this result is due to the older students’ greater experience, which provides a broader context in which to understand their summer research projects and the potential impact of their work.

Students’ Future Plans

As part of this study, students were asked a number of questions about their short- and longer-term plans for research and graduate studies. On the post-experience survey 73% of respondents indicated that they had taken or planned to take the GRE (Graduate Record Examination), which is a requirement for most graduate programs and is a good predictor of students’ intention to apply to graduate school. 76% of students indicated an interest in applying to a graduate program at Michigan State University. 87% of students indicated that they planned to pursue future research opportunities, 62% reported that they were preparing a conference presentation, and 58% indicated that they were preparing a research publication. Table 5 summarizes these results from the post-experience survey.

In addition to these shorter-term goals, students were also asked about their career and educational goals after completing their bachelor’s degree. On the pre-experience survey, 61% indicated that they planned to attend graduate or professional school full-time, while an additional 7% expected to pursue part-time graduate studies while working. These questions were repeated on the post-experience survey, with 67% of students indicated that they planned to pursue full-time graduate or professional studies; 7% remained interested in pursuing part-time graduate school. Table 6 summarizes the responses to these questions.

Table 5: Students' Short-Term Plans for Research and Graduate Study

	Post-Survey (n=55)	
	Number	%
Have you taken, or plan to take, the GRE?	40	73%
Are you considering applying to MSU for graduate school?	42	76%
Do you intend to pursue another mentored research experience in the future?	47	87%
Are you preparing to present the research you did this summer at a conference during the 2012-13 academic year?	34	62%
Are you preparing a publication based on the research you did this summer?	32	58%

Table 6: Students' Longer-Term Educational and Career Plans

After completing your bachelor's degree, what do you think you are most likely to do? Choose one.	Pre-Survey (n=74)		Post-Survey (n=55)	
	Number	%	Number	%
Go directly into the workforce	12	16%	6	11%
Go into the workforce, and attend graduate school part-time	5	7%	4	7%
Attend Graduate School (Masters or Doctorate) full-time	37	50%	33	60%
Attend Professional School (medical, law, etc.) full-time	8	11%	4	7%
I have no idea	8	11%	6	11%

Initial Goals and Final Impressions

At the outset of the summer, students' were asked on the pre-experience survey to indicate the reason(s) they had chosen to apply to this summer research program. Students' responses, in descending frequency, were as follows:

- 91%: it will enhance my resume
- 88%: to gain practical experience for a future career
- 79%: it was a paid position
- 75%: to develop a mentoring relationship with a faculty member
- 72%: it sounded interesting
- 71%: to help prepare me for graduate school
- 37%: a faculty/staff member approached me about the opportunity

Practical, career-oriented goals topped students' lists of reasons for participating in the summer research experience. This finding is consistent with prior research about students' motivations

for undergraduate research,^{3,11,18,20,21} and is a reflection of students' practical concerns about exploring options and preparing for future careers (whether in research, academia, or industry).

The post-experience survey revisited several of these issues as part of a larger examination of students overall impressions of the summer research experience. Students were asked to indicate their level of agreement with a series of value statements about the summer experience using a five-point Likert scale (Strongly Agree=1, Agree=2, Neutral=3, Disagree=4, Strongly Disagree=5). Table 7 summarizes students' responses to these questions in the post-experience survey.

Examining the frequency of “Strongly Agree” and “Agree” responses, nearly all students (98%) agreed that participating in this summer program had enhanced their resumes, which is not surprising given the interest in resume-building that students expressed in the pre-experience survey. However, the post-survey also asked students to examine their experiences in more detail, focusing specifically on the types of “resume-building” skills and experiences that students might gain by participating in undergraduate research. For instance, 90% or more of the students reported that participating in the program helped improve their research skills, gave them opportunities to contribute to the knowledge creation process, and improved their understanding of the importance of ethical conduct in research. Students also found the summer research experience helpful in preparing them for graduate studies (92%) and for defining their career goals (82%).

Table 7: Students' Overall Impressions of the Summer Research Experience

Participating in this research experience	Post-Survey (n=51)	
	SA / Agree	%
strengthened my resume	50	98%
improved my research skills	49	96%
gave me the opportunity to contribute to the knowledge creation process	48	94%
was a worthwhile experience	48	94%
helped prepare me for graduate study	47	92%
gave me the opportunity to build a relationship with a research mentor	47	92%
helped me to understand the importance of ethical conduct in research	46	90%
is something I would recommend to other students	45	88%
helped me to understand how research contributes to society	45	88%
helped define my career goals	42	82%
enabled me to take what I have learned in class and apply it to a setting outside of the classroom	41	80%
increased my interest in graduate study	39	76%

Concluding Discussion: Reflecting on the Undergraduate Research Experience

Overall, students' impressions of the summer research program were very positive. On the post-experience survey, 94% of the students found the experience worthwhile and 88% would recommend the program to other students. In addition to this quantitative data, the post-experience survey included several open-ended questions where students could elaborate on their summer research experience. Many students commented on the value of the relationships they built with faculty and other members of their research teams. For example, one student noted: "The relationship that I developed with my research mentor is the most important aspect of my summer. The research was interesting and awesome to work on, but a good relationship with my mentor motivated me to work harder." Another student commented that the most valuable part of the summer experience was "being able to talk one on one and ask questions with other people working in the lab and the research mentor." Several students commented on the value of seeking advice from professionals and experts in the field, of "observing and talking to graduate students" and of gaining "information about [the] graduate school application process."

For other students, the most valuable aspects of the summer experience were the skills they developed by participating in research. One student commented: "the process of meticulous data collection and analysis is a valuable skill, as well as the ability to construct thoughts in writing." Other students noted more specific skills, such as: "having to design and conduct my own experiments and write a paper about my work" or "time management." Developing independence and gaining autonomy was another common theme in students' open-ended responses to the final survey. For one student, the highlight of the summer experience was "getting to design and carry out my own project." Another student found that working on an independent research task required relying "on my own motivation rather than being told I should do something."

For many students, the summer program offered a freedom from coursework and the opportunity to devote full-time effort to research. Participating in this summer research experience gave students the opportunity to "feel like a grad student" and engage with a community of researchers. The pre- and post-experience survey data provide a snapshot of students' expectations about undergraduate research, and found that they largely matched students' actual experiences during this summer program. Overall, the data reported here indicate that participating in undergraduate research was a positive experience for the vast majority of students, and helped students build skills that are important for success in graduate school and in future careers.

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Appendix A: Pre-Experience Survey

Demographic information was collected from students' applications to the research program, including: Gender, Ethnicity, Expected graduation term, Undergraduate Institution, Primary Major, Citizenship, GPA, Age.

INTRODUCTION

We are conducting a research study on the learning outcomes and student perceptions of summer undergraduate research experiences. You have been selected to take part in a research study that evaluates your undergraduate research experience during Summer 2012. Your responses, along with those from other students conducting research at Michigan State University, will help us to understand your experiences as a student researcher and provide valuable information as to how we can improve future research opportunities.

At the end of the summer research experience, you will be asked to complete a post-experience survey. The email address you provided with your program application will be used to correlate your pre- and post-experience survey answers. This information will be kept confidential and not used for any purposes other than matching your pre- and post-experience responses.

EXPECTATIONS OF THE RESEARCH EXPERIENCE

The following questions explore your expectations of the summer research experience at Michigan State University, in relation to the development of different skills, academic decisions, and other experiences.

1. Please consider **the area of research you are working in this summer**, and indicate your level of agreement with each of the following statements, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
 - I possess a basic understanding of the process of research in this area
 - I possess a basic understanding of the research literature in this area
 - I possess a basic understanding of the research skills and/or lab techniques in this area
2. Please consider **your current knowledge, abilities or skills** and indicate your level of agreement with each of the following statements, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
 - I have strong leadership skills.
 - I have strong interpersonal (social) skills.
 - I am able to develop a professional network.
 - I am able to work effectively with others.
 - I am able to work effectively on my own.
 - I am able to manage my time effectively.
 - I am able to work through obstacles or challenges.
 - I am able to write a research abstract.
 - I am able to create a research poster.
 - I am able to give an oral research presentation.
 - I possess a basic understanding of the graduate school application process.
 - I possess a basic understanding of how to do statistical analysis of research data.
 - I possess a basic understanding of how to interpret research data.
 - I possess a basic understanding of how to apply research data.
 - I am able to communicate technical information to people within my discipline.
 - I am able to communicate technical information to people outside my discipline.
3. What tasks or activities do you expect to do as part of your summer research experience? Check all that apply:
 - Defining a research problem
 - Developing a research hypothesis
 - Designing an experiment
 - Gathering data
 - Analyzing data
 - Modeling data

- Writing about research process/results
 - Presenting research process/results
 - Working in a research group or team
 - Work in a laboratory setting
 - Work in an office setting
 - Field work outside of a laboratory or office setting
 - Developing/using databases
 - Developing/using spreadsheets
 - Developing websites
 - Developing computer programs
 - Computational analysis
 - Statistical analysis
 - Other: _____
4. Please indicate Yes or No in response to the following questions:
- Is this summer your first mentored research experience?
 - Have you previously published any research in a journal or conference proceedings?
 - Have you previously presented any research in an oral or poster format?
 - Have you taken, or plan to take, the GRE?
 - Have you received communications from your research mentor?
 - Do you have a clear understanding of your research mentor's expectations?
 - Do you have a clear understanding of your research project for this summer?
 - Are you considering applying to Michigan State University for graduate school?
5. After completing your bachelor's degree, what do you think you are most likely to do? Choose only one.
- Go directly into the workforce
 - Go into the workforce, and attend graduate school part-time
 - Attend Graduate School (Masters or Doctorate) full-time
 - Attend Professional School (medical, law, etc.) full-time
 - I have no idea
 - Other: _____
6. Why did you choose to participate in this undergraduate research experience? Check all that apply:
- To help prepare me for graduate school
 - It was a paid position
 - It will enhance my resume
 - To develop a mentoring relationship with a faculty member
 - A faculty/staff member approached me about the opportunity
 - To gain practical experience for a future career
 - It sounded interesting
 - Other: _____
7. How many other summer 2012 research experiences did you apply to? Select one option:
- 0 1 2 3 4 5+
8. If you were not participating in this research experience, what would you be doing this summer instead?
9. What knowledge or skills do you hope to gain from your summer research experience?
10. What specific topics or information do you hope will be covered as part of the professional development activities during this summer research experience?

Appendix B: Post-Experience Survey

Demographic information was collected from students' applications to the research program, including: Gender, Ethnicity, Expected graduation term, Undergraduate Institution, Primary Major, Citizenship, GPA, Age.

INTRODUCTION

We are conducting a research study on the learning outcomes and student perceptions of summer undergraduate research experiences. You have been selected to take part in a research study that evaluates your undergraduate research experience during Summer 2012. Your responses, along with those from other students conducting research at Michigan State University, will help us to understand your experiences as a student researcher and provide valuable information as to how we can improve future research opportunities.

At the beginning of the summer research experience, you were asked to complete a pre-experience survey. The email address you provided with your program application will be used to correlate your pre- and post-experience survey answers. This information will be kept confidential and not used for any purposes other than matching your pre- and post-experience responses.

MENTORING

Mentoring is an important aspect of an undergraduate research experience. A mentoring encounter is defined as an opportunity for you to interact with an individual (e.g., faculty member, post-doctoral or graduate student, staff member, another student) who helps to guide you through your research experience. Mentoring encounters could occur on an individual basis (i.e., you and one person) or they may occur in group settings (e.g., weekly laboratory meeting, group research team meeting). The questions in the next section explore your mentoring experiences in relation to your summer research experience.

1. Who do you consider to be your **primary research mentor**? This should be the person who primarily supervised your research experience and provided you with feedback. Check only one.
 - Faculty Member
 - Graduate student
 - Post-doctoral scholar (i.e., someone who has earned a PhD)
 - Other: _____
2. On average, how many hours per week did you interact with your **primary research mentor**?
 - 0
 - 1-5
 - 6-10
 - 11-20
 - 21-30
 - 31-40
 - 41+
3. How valuable were the interactions with your **primary research mentor**?
 - Not applicable – I did not interact with my primary research mentor
 - Poor – they were not useful or helpful
 - Fair – they were somewhat useful or helpful
 - Good – they usually were useful or helpful
 - Excellent – they always were useful or helpful
4. Indicate your level of agreement with the following statements about your interactions with your **primary research mentor**, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
 - My primary research mentor set expectations for me
 - My primary research mentor listened to me
 - My primary research mentor answered my questions
 - My primary research mentor checked in with me regularly

- My primary research mentor helped me get started on my project
 - My primary research mentor provided constructive feedback as my project progressed
 - My primary research mentor encouraged me to offer my own ideas about the project
 - My primary research mentor helped me to become more self sufficient as a researcher
 - My primary research mentor helped me to understand how my project contributes to the broader academic discipline
 - My primary research mentor helped me to understand how my project contributes to society
 - My primary research mentor helped me to establish professional networks of people
 - My primary research mentor talked with me about my future career plans and/or graduate school options
5. On average, how many hours per week did you interact with **your research group**?
- Not applicable – I was not part of a research group
 - 0
 - 1-5
 - 6-10
 - 11-20
 - 21-30
 - 31-40
 - 41+
6. How valuable were the interactions with **your research group**?
- Not applicable – I did not interact with a research group
 - Poor – they were not useful or helpful
 - Fair – they were somewhat useful or helpful
 - Good – they usually were useful or helpful
 - Excellent – they always were useful or helpful

IMPACT OF THE RESEARCH EXPERIENCE

The following questions explore the impact of your summer research experience at Michigan State University on the development of different skills, academic decisions, and other experiences.

7. Please consider **the area of research you worked in this summer**, and indicate your level of agreement with each of the following statements, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
- I possess a basic understanding of the process of research in this area
 - I possess a basic understanding of the research literature in this area
 - I possess a basic understanding of the research skills and/or lab techniques in this area
8. Please consider **your current knowledge, abilities or skills** and indicate your level of agreement with each of the following statements, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
- I have strong leadership skills.
 - I have strong interpersonal (social) skills.
 - I am able to develop a professional network.
 - I am able to work effectively with others.
 - I am able to work effectively on my own.
 - I am able to manage my time effectively.
 - I am able to work through obstacles or challenges.
 - I am able to write a research abstract.
 - I am able to create a research poster.
 - I am able to give an oral research presentation.
 - I possess a basic understanding of the graduate school application process.
 - I possess a basic understanding of how to do statistical analysis of research data.
 - I possess a basic understanding of how to interpret research data.

- I possess a basic understanding of how to apply research data.
 - I am able to communicate technical information to people within my discipline.
 - I am able to communicate technical information to people outside my discipline.
9. What tasks or activities did you take part in as part of your summer research experience? Check all that apply:
- Defining a research problem
 - Developing a research hypothesis
 - Designing an experiment
 - Gathering data
 - Analyzing data
 - Modeling data
 - Writing about research process/results
 - Presenting research process/results
 - Working in a research group or team
 - Work in a laboratory setting
 - Work in an office setting
 - Field work outside of a laboratory or office setting
 - Developing/using databases
 - Developing/using spreadsheets
 - Developing websites
 - Developing computer programs
 - Computational analysis
 - Statistical analysis
 - Other: _____
10. Please indicate Yes or No in response to the following questions:
- Do you intend to pursue another mentored research experience in the future?
 - Are you preparing to present the research you did this summer at a conference during the 2012-13 academic year?
 - Are you preparing a publication based on the research you did this summer?
 - Have you taken, or plan to take, the GRE?
 - Did you keep a research notebook this summer?
 - Are you considering applying to Michigan State University for graduate school?
11. After completing your bachelor's degree, what do you think you are most likely to do? Choose only one.
- Go directly into the workforce
 - Go into the workforce, and attend graduate school part-time
 - Attend Graduate School (Masters or Doctorate) full-time
 - Attend Professional School (medical, law, etc.) full-time
 - I have no idea
 - Other: _____
12. Please consider your **overall impression of the summer research program** and indicate your level of agreement with each of the following statements, using the scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.
- Participating in this research experience improved my research skills
 - Participating in this research experience increased my interest in graduate study
 - Participating in this research experience helped prepare me for graduate study
 - Participating in this research experience helped define my career goals
 - Participating in this research experience strengthened my resume
 - Participating in this research experience gave me the opportunity to build a relationship with a research mentor

- Participating in this research experience gave me the opportunity to contribute to the knowledge creation process
- Participating in this research experience enabled me to take what I have learned in class and apply it to a setting outside of the classroom
- Participating in this research experience helped me to understand how research contributes to society
- Participating in this research experience helped me to understand the importance of ethical conduct in research
- Participating in this research experience was a worthwhile experience
- Participating in this research experience is something I would recommend to other students

13. What part(s) of the summer program did you find **most** valuable or helpful?

14. What part(s) of the summer program did you find **least** valuable or helpful?

15. Please share any additional comments, suggestions for changes, or feedback about the summer program.