

Researching Undergraduate Researchers: How do Lake Forest students view undergraduate research?

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Abstract

In order to increase the efficiency of learning at undergraduate institutions, many educators have conducted studies on the way students are taught. These methods range from simple lecture to active learning by hands-on research and group projects. For many science majors planning to continue on to professional or graduate school, independent research is strongly encouraged and provides a gateway for professors to teach skills and content in an environment other than a classroom. Many universities have conducted studies suggesting that conducting undergraduate, lab-based research has many benefits, but these benefits and the attitude towards the benefits varied between studies. To understand what students at Lake Forest College expect from research experience, a survey was conducted using participants from core and elective biology courses. The study suggested that some groups of students may need more encouragement to engage in research while other students need reinforcement of improved skills.

Introduction

Undergraduates across the world compete for jobs and admissions. Although grades and standardized testing may seemingly prevail as the key factors of future success, another feature of the undergrad experience is becoming more prominent in setting apart great academic and profession candidates: undergraduate research. Students focusing on the sciences often conduct independent laboratory research in preparation for graduate or medical school, but many other students do not realize the full benefits of conducting research or, specifically, a senior thesis. To elucidate some of the common impressions undergrads have toward research, I surveyed an array of biology students on their thoughts and experiences. With advice from recent biology alumni, conclusions from literature sources, and thoughts from Lake Forest students, undergraduate research was evaluated to find how it can benefit students interested in careers beyond medical or graduate school and how undergraduate research can be further improved here at Lake forest College.

There are many reasons why students may be interested in conducting research during their undergraduate years. Students planning to continue their education to graduate school conduct research to prepare and learn the skills they will be using during their extended education. The research experience provides an environment that teaches future graduate students the techniques they will be using and allows the student to test what type of research they enjoy. Medical students also tend to engage in undergraduate research to enhance their critical thinking abilities and to augment their medical school applications. Beyond these groups of students, however, there are few who see the value of conducting lab-based research. These groups include students who don't plan to continue their education

beyond undergrad or double-major students planning to enter a career in their non-science major.

But why should students not planning careers requiring research experience consider engaging in undergraduate research? Some students, like Lake Forest College alumni Karla Avila-Peregrina '11, conducted undergraduate research solely for the interest of the topic before starting a career in another field. However, conducting research in a topic other than a student's primary focus is not without benefits. Karla, a philosophy-biology double-major, completed a senior thesis in biology before continuing on to Teach for America as an 8th grade algebra teacher. Karla says her thesis had her "constantly clarify and 're-teach' subject specific content, which is a good exercise for what I do now." The skills learned during undergraduate research are far-reaching and plentiful. In a study by Carolanne Kardash, a professor of Educational Psychology at the University of Missouri, the outcomes of undergrad science research included the "ability to think independently, growth in originality, creativity, initiative, curiosity, enthusiasm, and resourcefulness" (2000). None of these improved abilities demand a relation solely to the sciences but instead benefit students in all disciplines. Kardash also explains that research can foster personal development through increased tolerance of obstacles and ability to work independently, providing further evidence that conducting lab research supports more than just lab skills.

A graduate of Lake Forest College, Angie Eakley '00, is an embodiment of this concept; after completing a biology thesis, she began a career as a graphic designer. Eakley states that "writing a thesis requires planning, organization, critical thinking, and motivation, which are beneficial skills in any field." Additionally, several other bio thesis-completing alumni offer similar opinions: the skills learned while working on a thesis research project are invaluable for all career and education pathways.

Additionally, a study by Faust and Paulson (1998) suggested that active learning was beneficial in improving understanding of a topic and in retaining students in that subject area. Active learning includes group work and discussion as well as hands-on experience. This paper also reported that students who engage in active learning had a more enjoyable experience with the subject material. Similarly, Chaplin (2003) found that students need to engage in studies that progressively challenge the student to think more independently. Independent undergraduate researchers will learn how to read and interpret primary literature, formulate and test hypotheses, and write to specific audiences. While this study was conducted primarily with students in the sciences, its conclusions can be applied to many disciplines. Understanding previous work done in any field is vital to progress. Additionally writing and presentation skills will be used in almost all career paths.

While these studies and alumni highly praise the benefits of undergraduate research, the opinions of the students here at Lake Forest College are still largely unknown. By surveying students in several science courses spanning all years and several majors, I sought to find why students interested in the sciences either did or did not engage in independent research.

*These authors wrote the paper for Biology 493: Independent study supervised by Dr. Shubhik Deburman

Results

Using the responses of ninety students participating in core classes of the biology major tract, I have organized the results to separate the responses based on future plans, year of college, and gender.

When separated by future plans, the responses of students planning to attend medical school (n=27), students planning to attend graduate school (n=27), and students who planned to pursue another career path (n=20) were averaged and graphed (Figure 1). Since students planning to continue their education in the sciences, medical or graduate, are generally believed to be more involved with undergraduate research to improve their chances of getting accepted to the school of their choice, I compared their responses against those of students with other future plans. Students planning to pursue medical or graduate school both agreed that conducting undergraduate research would help them reach their career/education goals and would also make them a more desirable applicant while students planning to pursue other plans disagreed to these statements. Despite these initial responses, students who

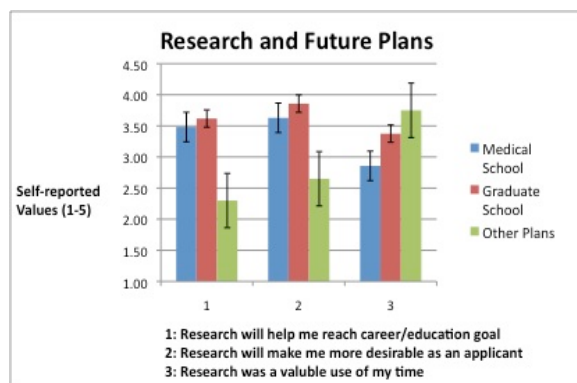


Figure 1: The self-reported score of students separated by students who plan to attend medical school, graduate school, or other plans for three survey responses. 1 is strongly disagree, 3 is neutral, and 5 is strongly agree.

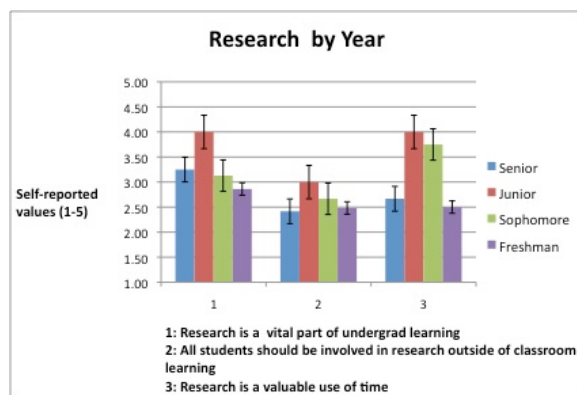


Figure 2: The self-reported score of students separated by year of college for three survey responses. 1 is strongly disagree, 3 is neutral, and 5 is strongly agree.

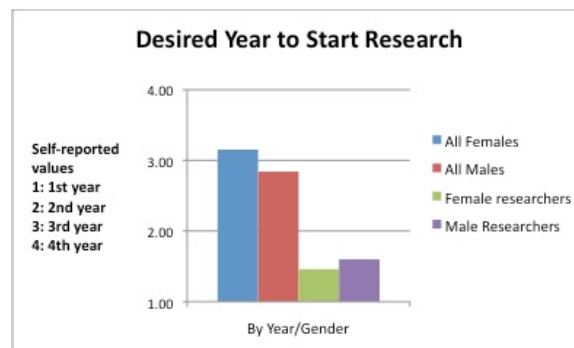


Figure 3: The self-reported score of students separated by year of college for three survey responses. 1 is strongly disagree, 3 is neutral, and 5 is strongly agree.

reported that their time spent conducting research was a less valuable use of their time than either students planning to pursue graduate school or other plans. The students with other plans were most satisfied with their experience.

had conducted research gave surprising responses: students who planned to pursue medical school

Next, I looked at the responses of students based on their year of college for whether they agreed that research is a vital part of undergraduate learning, that all students should be involved with undergraduate research, and that research was a valuable use of time (Figure 2). For each of these statements, the general trend of response was that students agreed more with each additional year they attended college. Senior students, however, did not follow this trend and were less likely to agree with these statements (possibly due to the stress of a senior thesis!). Also, when asked what year students would like to start conducting research, freshmen reported wanting to start during their junior year of college while all other years would like to have started between freshman and sophomore year.

Finally, I looked at differences based on gender for students who had conducted research and who had not conducted research. A general finding was that students who had conducted research suggested starting during freshman or sophomore year of college while students who had not conducted research planned to start junior or senior year (Figure 3). Differences in gender were less clear, but suggested that females were more willing to engage in undergraduate research and were more likely to agree that research would help them with their future plans and that the faculty was supportive. Females that had completed undergraduate research did not change their opinions on these statements, but males who had completed research became more supportive of the benefits of research.

Conclusion and Discussion

The responses of students from Lake Forest College provide insight to promote undergraduate laboratory research and aid students in obtaining these skills and qualities. From the results we know that males and students not planning to go to graduate or medical school are less likely to think that research will benefit them. However, these two groups also reported being highly satisfied with the research experience after having completed their own research. Continued faculty support and encouragement to participate in independent research will help these students become more interested earlier and thus benefit these students more. One the other hand, females and students planning to go to medical school are less likely to value the time spent conducting research. Although this survey did not address which characteristics of

research were unsatisfactory, a study by Lappatto (2004) found that students who were unsatisfied with their research experience specified that scientific writing, posing and testing a hypothesis, and supporting the “bigger picture” were underdeveloped by the experience. Perhaps these same attributes are lost among student researchers at Lake Forest as well. To address this concern, professors leading a laboratory can point out student’s skills as they develop or further emphasize these skills to the students participating in their research.

While many students at Lake Forest conduct research and are satisfied with the benefits and experience they gain, other students are still less likely to become involved or do not obtain the desired skills. In order to increase interest and satisfaction of the undergraduate research experience, professors and research advisors can promote research to specific groups of students who may be less interested in research, males and students not planning to for medical or graduate school, and can emphasize and point out skills that students are learning through independent undergraduate research.

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