

Investigation of Library Research Strategies in an Undergraduate Biochemistry Project

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Abstract

This paper investigates the use of Miami University Library resources and services in undertaking a Biochemistry research project spanning the author's entire undergraduate career at Miami University.

Introduction

For this Biochemistry study, the author investigated the Twin Arginine Translocation (Tat) protein transport pathway in the mitochondria of *Arabidopsis thaliana*. This project stemmed from a previous research, which showed that in the *Nicotiana tabacum* plant, *mito-Tat* genes were expressed more when salicylic acid stress was applied, highlighting the vital, stress-mediating role of mitochondria in plants. ¹ In this project the author used multiple library resources in planning experiments, evaluating results and finally, in compiling work from 3.5 years, into a scientific written report to fulfill the requirements for Biology Departmental Honors.

Experimental Goals, Methods and Outcomes

I. Designing Experiments and Analyzing Results

When I first joined this lab in my freshman year at Miami University, I mostly observed and learned the different biochemical techniques undertaken by the graduate students. During this stage I mostly library resources to investigate protocols on techniques such as western blots or DNA sequencing. However, beginning my sophomore year, I started to ask more questions in the lab such as “Why do we study this?” or “What do these results mean?” With this, I studied plant biochemistry more in depth through textbooks borrowed through B.E.S.T library. I then realized that with biochemistry research, one needs to learn the complex molecular and cell biology in an organism first, in order to begin to understand the physiological changes that are seen externally.

This curiosity motivated me to apply for an Undergraduate Summer Scholars Award, which I was fortunate to receive so I could dedicate my full-time effort to a research project. My research mentor, Dr. Carole Dabney-Smith encouraged me to pursue an independent project and given my pre-medical background, I chose to work on the only mitochondrial project in the lab. Since I

was the first person to study this, I spent the first three weeks of the summer conducting secondary research on literature related to this topic. This posed to be a challenge since only a handful of labs in the world investigate this. However, with the help of my mentor, we designed a few preliminary experiments for the summer.

Since then, I have designed numerous experiments myself and analyzed results, by studying the different techniques used by previous researchers. They range from Confocal Microscopy, Genetically Engineered Fluorescent Proteins to quantifying RNA levels to obtain the relevant results. Since my research project depends on clear microscope images, I have used the software on computers at the Center for Information Management (CIM) to scan and edit pictures. I also regularly use statistical software such as SAS on these computers to analyze quantitative data.

I also learned, the hard way, that in scientific research, good experimental planning will save even months of time in a research project. Furthermore, I make it a point to write a 'pre-lab' the previous day for each experiment I perform. It is essentially a detailed plan of the materials and expected results for each experiment that I conduct. The library has been a vital resource for both these, since I obtain all my information through scientific journals which offer free subscriptions to Miami University students through the MULibrary system.

II. Scientific Written Report

Since I was a freshman my academic goals was to graduate with Biology Departmental Honors. The Scientific Written Report due at the end of my senior year, is the final step in obtaining this. To this end, I am extremely grateful to the library resources as they have assisted me most in this capacity.

For starters, the Howe Writing Center student consultants have helped me improve my writing immensely. They were able to give me personalized and patient advice, since I am an international student and English is my second language. Moreover, I used OhioLINK to find thesis or dissertations uploaded by previous graduate students from my lab, to get an idea of how to organize a 50 page scientific report.

On a different note, MU Library was there to help me when my laptop broke and was sent for repairs, a week before an abstract submission deadline for a national scientific conference in San Diego. They trusted me enough to lend me a Chromebook for a week. I am grateful for this help, since I successfully submitted the abstract on time and was even accepted to present my research poster!

Furthermore, I have won numerous essay competitions through the Howe Writing Center. Although this is not directly connected to my research project, the monetary help from such awards have helped me dedicate more time to my laboratory work, instead of working overnight shifts at the Armstrong Student Center.

Rationale and Feasibility of the Project

My undergraduate research project is by far my most fulfilling academic experience in College. I have gained a plethora of practical experience, learned to critically analyze scientific literature and presented my results at national conferences. The MU Library system resources and services have helped me in numerous ways throughout this experience at Miami University and I am immensely grateful for that.

References

1. van der Merwe, J. A., & Dubery, I. A. (2007). Expression of mitochondrial tatC in *Nicotiana tabacum* is responsive to benzothiadiazole and salicylic acid. *Journal of plant physiology*, *164*(9), 1231-1234.