RESL 1500 - Reflective Essay

Connor Johnson

Throughout my undergraduate studies in chemical biology at Thompson Rivers University, I have been actively involved in research projects across analytical chemistry, food science, and organic chemistry. These experiences have not only built a strong foundation in experimental design, instrumentation, and data analysis, but have also changed the way I approach scientific challenges, communicate my findings, and solve problems.

Before I began my research, I saw the process as a straightforward application of classroom learning. I assumed that research would simply involve forming a hypothesis, running experiments, and drawing conclusions. However, my early experiences taught me that research is far more dynamic and unpredictable. My first project, which involved determining trace metals in bee pollen by ICP-MS, challenged those expectations. In this study, I compared bee pollen supplements from across Canada to assess regional trace metal variations bee pollen samples. Presenting these findings at the 2024 Canadian Mineral Analysts Conference forced me to adapt quickly, defend my methodology, and learn from unexpected outcomes as I was critiqued by analytical chemists from industry.

Shortly after, I worked on another ICP-MS project focused on determining trace metals in soil samples collected from the House of Learning Green Roof. This sustainability project connected my laboratory work with real-world environmental concerns. Handling soil samples and analyzing them for trace metal content helped me understand the practical implications of

my research, emphasizing the importance of precision and attention to detail when dealing with environmental data.

As I progressed in my studies, I moved on to a directed studies project in organic chemistry. In this project, I developed an ortho-directed metalation reaction for an advanced laboratory course. I had to optimize reaction conditions and refine product characterization methods—a process that required deep thinking about reaction mechanisms and synthetic techniques. Presenting this work at TRU's Undergraduate Research and Innovation Conference and the SUPER Conference provided me with valuable feedback and helped me learn how to effectively share my research with both peers and faculty.

These projects have not only advanced my technical skills but have also significantly influenced how I think about and conduct research. I learned to embrace uncertainty and view unexpected results as opportunities to refine my experimental approaches. For example, when my initial ICP-MS experiments produced ambiguous results, I had to reassess my methods, consult with mentors, and make adjustments. This iterative process has taught me the importance of flexibility and persistence in research. I now understand that setbacks are an integral part of learning and that every unexpected result provides a chance to improve and gain deeper insights.

In addition to refining my laboratory skills, my research experiences have greatly improved my ability to communicate complex ideas. Presenting my preliminary findings at my Honours Update for CHBI 4990 was a turning point for me. I learned how to analyze data in real-time, articulate my thoughts clearly, and engage in discussions with faculty and students. This experience made me more confident in sharing my research and defending my conclusions as my thesis defense looms over me. Whether I was discussing trace metal data at CMA 2024 or

explaining the intricacies of an ortho-directed metalation reaction at TRU conferences, I became more comfortable communicating complex scientific information to diverse audiences.

My current honours project is a continuation of my journey into analytical chemistry. I am investigating volatile organic compounds (VOCs) in bananas with the goal of developing a new banana flavoring recipe. This project compares the VOC profiles of commercial banana flavoring with those of the modern Cavendish and the historical Gros Michel varieties. Using headspace gas chromatography-mass spectrometry (HS-GC-MS), I am identifying the key aroma compounds that give each banana its unique flavor. This work not only has practical implications in food science but also reinforces the importance of a methodical approach to experimental design and data interpretation.

Beyond the laboratory, I have also taken on the role of a mentor by training fellow students in techniques like microwave digestion and ICP-MS. Teaching these methods has required me to break down complex procedures into simple, understandable steps. This experience has deepened my understanding of the techniques myself, while also highlighting the importance of clear communication and collaboration in scientific work.

Reflecting on my research journey, I realize that each project has contributed significantly to my personal and professional growth. I started with a basic understanding of research, but my experiences have reshaped my mindset. I now appreciate that research is not just about obtaining results—it's about questioning assumptions, learning from failures, and continually adapting methods to improve outcomes. This realization has helped me develop a more critical and flexible approach to scientific inquiry.

The skills and insights I have gained from these projects will undoubtedly impact my future. As I plan to pursue graduate studies and eventually a career in food or analytical chemistry, the technical expertise and problem-solving abilities I have developed will be essential. My work with ICP-MS and HS-GC-MS has provided a strong background in instrumental analysis, while my experiences presenting and teaching have honed my communication skills. I am now more confident in my ability to conduct independent research, interpret data effectively, and share my findings with others.

Looking back, I see how each project—from analyzing trace metals in bee pollen and soil to developing an innovative organic reaction and exploring the chemistry behind banana flavors—has played a role in my development as a researcher. These experiences have taught me the importance of resilience, adaptability, and clear communication in the face of complex scientific challenges. They have also reinforced my commitment to pursuing a career where I can continue to ask questions, test hypotheses, and contribute to meaningful scientific advancements.

In summary, my research journey has been transformative. It has moved me from a simplistic view of research as a linear process to a deeper understanding of its iterative and multifaceted nature. Every experiment, every presentation, and every moment of troubleshooting has contributed to a well-rounded skill set that prepares me for future challenges. I am excited about the opportunities that lie ahead and am confident that the lessons learned through my undergraduate research experiences will serve as a strong foundation for my future endeavors as I move on to graduate studies in the fall.