REFLECTIVE ESSAY

During my time at Thompson Rivers University (TRU), research was an integral part of many courses. In laboratory-based classes, we often worked in groups on small projects designed to either test our knowledge or prepare us for industry-related work. However, my perspective on research and laboratory work changed dramatically after I applied for a directed studies course and began my research under the supervision of Dr. Naowarat Cheeptham and Dr. Kingsley Donkor. This experience not only deepened my understanding of research but also allowed me to grow as a student, scientist, and individual.

Before starting my research project, my experience in laboratory courses was mostly structured. Everything felt like following a set of instructions, similar to working through a manual. In most cases, these small class projects produced expected outcomes because they were based on well-established methods designed for learning purposes. While these experiments helped reinforce concepts, they did not prepare me for the complexities of real research.

When I first started my independent research project, I felt lost and overwhelmed. The project seemed much bigger than me, and I initially doubted my ability to complete it. Unlike laboratory coursework, where the outcome was often predetermined, my research had no guaranteed results. The uncertainty of not knowing whether an experiment would work was intimidating. However, as I read more scientific articles and received advice from my supervisors, I gradually became more comfortable. I realized that research was fundamentally different from a university laboratory. While academic labs focused on teaching concepts, research labs pushed the boundaries of knowledge. The level of independence I had was both

liberating and intimidating, but it forced me to develop skills beyond just technical laboratory techniques. Through this process, I learned several key lessons about research, organization, adaptability, and scientific communication.

One of the first things I learned was that research was not just about reading a few papers and following a procedure. It was also an organizational challenge, particularly when working with living organisms. In order to conduct reliable and reproducible experiments, I had to follow Good Laboratory Practice (GLP). GLP was a set of guidelines designed to ensure the quality and integrity of non-clinical laboratory studies, which were essential in research. Adhering to these principles required me to be meticulous in planning and documenting my work.

My directed studies focused on developing a methodology for the characterization of bacteriophage structural proteins using MALDI-TOF MS (Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry). This research required careful planning, time management, and organization, particularly when preparing samples for analysis. I had to plan my time in the lab efficiently, scheduling tasks such as media preparation, autoclaving pipette tips, and preparing solutions ahead of time. Proper labeling and storage of reagents were also critical, as using expired chemicals could have compromised my results and set me back weeks or even months.

Additionally, maintaining an organized laboratory notebook was crucial. This allowed me to keep track of previous procedures, record observations, and identify potential sources of error. It also helped me refine my experimental approach by analyzing what worked and what did not. Keeping detailed records was invaluable when writing my research report, as it ensured data integrity and allowed me to confidently explain my findings. Additionally, research required me to step out of my comfort zone and develop new skills. I had to learn how to use unfamiliar equipment, troubleshoot technical issues, and even contact companies to inquire about reagents and instruments. I was surprised by how much time was spent researching methodologies and optimizing protocols before even stepping into the lab. This experience taught me that research was not just about conducting experiments; it was also about problem-solving and thinking creatively when faced with challenges.

Budget constraints also played a significant role in my research experience. Unlike class experiments, which were designed with ample resources, research operated on a limited budget. This meant that I had to be resourceful and sometimes modify protocols based on the equipment available. For example, I needed a heating block to warm small volumes of samples, but since one was not available, I had to improvise by using a thermocycler to heat my samples in PCR tubes. These small adaptations taught me the importance of flexibility and innovation in research.

Another crucial aspect of research was presenting and defending findings. As part of my directed studies, I had the opportunity to present my research at conferences, where I had to explain my work to both experts and non-experts. This experience significantly improved my confidence and public speaking skills.

Presenting my research allowed me to refine my communication skills, as I had to break down complex scientific concepts into simpler terms. This was a valuable skill not only for academic settings but also for future job interviews, networking events, and graduate school applications. Learning how to effectively communicate research findings was just as important as conducting the research itself, as discoveries held little value if they could not be shared and understood by others. In addition to oral presentations, I also gained experience in writing scientific reports. Writing my research report required me to synthesize large amounts of information, analyze data, and draw meaningful conclusions. This process strengthened my ability to think critically and articulate my findings in a clear and logical manner.

I strongly believe that research, whether through directed studies, an honors program, or an undergraduate thesis, should be an essential part of every student's academic journey. It provided invaluable hands-on experience, strengthened problem-solving skills, and built confidence. Most importantly, it allowed students to apply the theoretical knowledge they gained in their courses to real-world projects, making learning more meaningful and impactful