Biology LTPhil draft by Dr. Benjamin Harrison, December 2012
Dr. Harrison earned tenure at Concordia St. Paul in April 2017

Scientific research, the form of learning I am most familiar with, does not take place in a vacuum. The most successful forms of research involve collaboration between experts of diverse backgrounds and specialties. Collaboration is based on discussion and as such discussion is a major component of my learning philosophy. The vocalization, explanation, and sharing of ideas with both peers and teachers helps a learner gather information, weigh alternative ideas, and articulate novel concepts. The second major component of my learning philosophy is critical thought, during which the learner identifies gaps and misconceptions in existing knowledge based on the new information. It is during discussion that a learner is able to ask questions and state new facts in their own words thereby filling gaps and correcting misconceptions. The learner must then incorporate newly constructed knowledge to fit with and/or replace old knowledge. This stage, something I term alignment, represents a transformative hurdle for the learner because new knowledge must be aligned with both old knowledge and with the learner's belief structure. My learning philosophy sees discussion, critical thought, and alignment as a never-ending cycle leading to the construction of new knowledge.

Though critical thought and alignment are introspective and unique to the learner, I believe they both rely heavily on discussion. Discussion is beneficial to both the individual and the group because verbalizing ideas puts abstract thoughts into concrete terms (helping the individual) and introduces a new perspective on the concept (which helps the group wrestling with the new concept). Just as an expert in computer engineering doesn't understand why aligning DNA sequences is important, an expert in biology doesn't understand how to write computer code that will align a given DNA sequence. Yet through collaboration and discussion, these individuals are able to construct knowledge that neither would have been able to achieve on their own, i.e. the DNA sequence of the human genome. In order to harness the individual expertise of my students, I would make ample use of group work in my classroom. Teams will meet regularly to work on projects such as presentations. One-on-one peer review of short essays and papers will promote sharing of ideas and teach the art of giving constructive feedback. Large, class-wide discussions will promote interaction with myself and with classmates.

Student participation in discussions is paramount to my teaching philosophy and therefore I must do everything in my power to encourage students to engage with the

material, with myself, and with each other. I believe this hinges on my ability to create a safe and comfortable environment where all students know their ideas are heard and valued. To accomplish this, I will start by making it clear in both my syllabi and in early class periods that harassment of any kind will not be tolerated. I will continue this through the use of informal (and at times anonymous) writing exercises to help me understand where students are getting stuck. By helping students see that each individual has questions, many of which overlap, the hope is that the anxiety they may be feeling with regard to sharing their ideas will be assuaged.

The ideal outcome for the student leaving my class at semester's end is that they have improved their ability to investigate scientific problems. This boils down to three different skills: 1) Forming a pointed question, 2) designing a well-conceived experiment, and 3) interpreting results. As a young researcher, I was eager to run every experiment I could think of. The goal was to collect as much data as possible which would lead to discovery. This approach met with a large amount of failure. My experience has taught me that a well formed question leads to more elegant experimental design which simplifies data interpretation. A major learning outcome of my classes is an understanding of the relationship between these three core concepts of scientific investigation. No matter the level of the course, I want my students to leave my class with a respect for science, not a fear of it. My approach to achieving this general goal is through formative writing assignments that will build toward a summative paper. I will be able to guide students' development of a well-polished final product by providing feedback along the way. Through this approach, I want to help my students bypass the struggle I endured as a young researcher. Though not all my students will go on to do primary research, at the very least my class will impart on them a sound strategy for solving scientific problems.

As research calls on collaboration to unravel the mysteries of the world around us, learning calls on discussion to create knowledge. Discussion will be at the center of my classroom environment and will call upon the individual's unique expertise and perspective to help the class as a whole construct new knowledge. I will foster interaction in my classroom by creating a safe environment in which teamwork and participation are highly valued. Through these approaches, I believe students will walk away from my class with a deep appreciation and respect for scientific investigation.