Faculty Sabbatical Report for Fall 2011

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Introduction

One of my main teaching responsibilities within the Chemistry Department is the physical chemistry laboratory course sequence CHM 321-322: Physical Laboratory I-II. For experiments in these courses I have used a combination of those published in two textbooks, *Experiments in Physical Chemistry* by Garland, Nibler, and Shoemaker and *Experimental Physical Chemistry: A Laboratory Textbook* by Halpern and McBane, as well as those published in *The Journal of Chemical Education* and *The Chemical Educator*. Before performing work in the laboratory, students are required to locate experiments in these sources to educate themselves on a background for the experiment. The students then plan a procedure for an experiment based on the resources we have at Lebanon Valley College.

The experiments published in the two textbooks generally contain detailed background information, but rely on outdated instrumental techniques. Also, while the articles published in the journals may be updated in terms of instrumentation, the background information for the experiment is usually lacking. As a result, students end up searching through multiple sources that may be inconsistent with one another in terms of approach.

I was granted sabbatical leave for the Fall 2011 semester. According to the sabbatical proposal I submitted to Dr. Michael Green, Vice President for Academic Affairs and Dean of the Faculty, I planned to assemble a textbook on experimental physical chemistry that outlines basic modern laboratory techniques. The idea was be to have an updated textbook instructors may use in the physical chemistry laboratory course with modules that cover all aspects of the experimental approach, from designing and performing experiments to analyzing/summarizing data.

Review of Sabbatical

As I began my sabbatical, I chose to prepare a laboratory manual instead of a textbook on experimental techniques. The main reason for this change was that I decided to adapt several experiments from two existing textbooks and from published articles into a guided inquiry format. In an effort to keep costs down, the manual could be produced in house and sold to students through the bookstore.

The first part of the sabbatical I spent deciding on which laboratory experiments to incorporate into the two semester physical chemistry sequence. I settled on a total of fifteen experiments and one independent project. I planned to begin writing these over the course of my sabbatical semester, along with sections on safety, data collection and analysis, writing a laboratory report, and writing a research proposal.

The basic outline of each experimental write-up has the following: an objective, background information, a list of questions to be completed prior to working in the laboratory, an experimental section, data analysis, summary, and references. The background summarizes basic information the students need to answer a set of pre-laboratory questions. The questions guide students to crafting a hypothesis that they will then test in the laboratory in an experiment. The experimental section gives a basic procedure, then points them to resources for designing an experiment to test the hypothesis they have generated. The data analysis section describes what

they need to do with the collected data in order to prove or disprove their hypothesis. The summary section contains questions for the students to answer in preparing a brief paragraph about their findings. Finally, the references section contains the citations from the text to illustrate to the students acceptable sources, as well as the correct format.

To date, a number of the sections have been completed. During the summer of 2012 a student worker will work with me to test the experiments and to proof sections of the laboratory manual. A finished version will be implemented in the CHM 321-322 sequence for the 2012-2013 academic year.

Long Term Impact of Sabbatical Project

The end result of this sabbatical experience will be a laboratory manual for the physical chemistry laboratory course. Having information contained within a single source will streamline student preparation for designing and performing experiments, which will have a direct impact on student learning. The guided inquiry nature of the laboratory will increase the practice of critical thinking skills by the students and better prepare those continuing on with an independent project in CHM 510.