

Ventura College Sabbatical Leave Proposal for Fall 2024
Submitted by Erin R. Brocker, PhD, Chemistry Department

Instructor Sabbatical Leave Status

Full-Time Hire Date: August 2016

Previous Leaves: 0

Chem V01A Lab Curriculum Development Project

I. Background

General Chemistry I (Chem V01A) and its laboratory component (Chem V01AL) are required courses for nearly every science major and many health-related degrees and certificates. It also satisfies the general education requirement for physical science for both CSU-GE and IGETC. Unfortunately, Chem V01A has one of the lowest pass rates in the chemistry department. The course requires a solid foundation in algebra, abstract thinking, and critical thinking skills. The topics in the course are cumulative, so students that fall behind early in the course find it difficult to catch up. Chem V01A lecture is often the first transfer-level science course that students take. Failing Chem V01A can cause students to feel that they do not belong in science, technology, engineering, and math (STEM) major, especially among underrepresented students.

Chem V01A and Chem V01AL are currently offered as separate 3-unit lecture and 2-unit lab classes at Ventura College (VC). The lab and lecture classes are not linked, so the students in one lab section may come from two or more lecture sections with different instructors. Students are also not required to take Chem V01A and Chem V01AL concurrently; they can choose to take lab after successfully completing the lecture. However, lab provides students with valuable opportunities for hands-on work with the concepts and calculations from lecture. Lab also encourages students to work collaboratively which leads to a stronger sense of community in the classroom. The lab sections are capped at 24 students while lecture classes are capped at 50 or 55. I find that I am able to have more one-on-one interactions with students and get to know them individually during lab much better than in lecture.

In fall of 2022, the chemistry department asked the Office of Institutional Effectiveness to evaluate course success rates in the general chemistry lecture class when students take the lab class concurrently vs. when they only take the lecture course in a given term. The “Chemistry Lecture

Success Rates and Concurrent Lab Class Enrollment” report from the Office of Institutional Effectiveness found that “students who take the lecture and lab classes concurrently have a higher course success rate in the lecture course than those who don’t take the lab class concurrently. This effect is significant even after accounting for gender, ethnicity, and unit load.” Hispanic students and female students, two underrepresented groups in STEM, had enormously larger success rates in lecture when enrolled in Chem V01A and Chem V01AL concurrently versus when they were only enrolled in Chem V01A. Hispanic students had a 66.2% success rate when concurrently enrolled in lab and lecture versus 33.7% success rate when enrolled in lecture alone. Female students had a 70.1% success rate when concurrently enrolled in lab and lecture versus 45.3% success rate when enrolled in lecture alone. The detailed results of the analysis are shown below in Figure 1.

CHEM V01A				
	<u>Lecture and Lab</u>		<u>Lecture Only</u>	
	N	Course Success Rate	N	Course Success Rate
Asian Students	266	75.2%	31	67.7%
Hispanic Students	1,824	*66.2%	258	*33.7%
White Students	933	*73.6%	139	*56.1%
Female Students	1,566	*70.1%	223	*45.3%
Male Students	1,632	*68.4%	249	*42.2%
Under 20 years	1,756	*70.6%	228	*38.2%
20-24 years	988	*66.0%	185	*47.0%
25-29 years	304	70.7%	41	61.0%
Over 30 years	205	*69.8%	27	*44.4%
Full-time Students	2,371	*71.9%	273	*48.4%
Part-time Students	882	*61.7%	208	*38.0%
All Enrollments	3,253	*69.1%	481	*43.9%

*Statistically significant difference

Figure 1: Course success rates for students enrolled on their first attempt in Chem V01A (General Chemistry I) between Fall 2012 and Spring 2022

After receiving the results of the “Chemistry Lecture Success Rates and Concurrent Lab Class Enrollment” report, the VC Chemistry department decided to move forward with curriculum changes to combine the Chem V01A lecture and Chem V01AL lab courses as a single CRN in an effort to improve student success. We also decided to adjust the lecture and lab

units to 4 lecture units and 1 lab unit to better match with Oxnard College (OC), Moorpark College (MC), and other local community colleges. The VC Chemistry Department submitted these major curriculum updates in the spring of 2023 with the plan for these changes to go into effect in Fall 2025, pending full state approval at all levels.

The VCCCD is planning to implement a compressed calendar in Fall 2025. The time block for 1-unit lab meetings on the current calendar is the same on the new compressed calendar. The overall number of lab hours per semester will decrease because the weeks in the semester will decrease. These unit and schedule changes will drastically reduce the lab meeting hours in the semester.

II. Purpose of the Sabbatical Project

The Ventura College Chemistry Department has offered a OER lab manual for over 20 years. Major revisions to update the lab manual were made in Spring 2019, but most of the existing experiments are designed to be completed over the span of two lab meetings (6 hours). The change in units for Chem V01AL from 2 units to 1 unit (6 hours/week to 3 hours/week) plus the compressed calendar rollout taking place in Fall 2025 means that our OER Chem V01AL lab manual will need a major overhaul. The purpose of this sabbatical project is to evaluate the existing experiments in the Chem V01AL lab manual, decide which experiments are essential, develop a new schedule for the experiments and revise the activities to fit within the new unit hours.

III. Components of the Sabbatical Project:

A. Develop new schedule of experiments and make revisions to existing experiments

At the beginning of the Fall 2024 semester, I will lead the discussion in the VC Chemistry Department regarding which experiments to keep as-is, which are repetitive and can be cut, and which must be revised to better fit the new unit hours and compressed calendar. Once the department has agreed on the essential experiments, I will put together a new course schedule of experiments and make any needed revisions. I will collaborate with the laboratory technicians to make changes and updates to the experiment supply lists.

B. Affordability and Accessibility Improvements

The Chem V01AL Lab Manual has been available at the campus bookstore for about \$13 or online at chemistrylabmanual.com for students to access and print for free at home. I would like to try separating each experiment in to separate Background, Procedure, and Experiment Report documents instead of the single document currently provided for each experiment. I am interested in trying to reduce the cost of the lab manual by moving the Background for each experiment on to Canvas.

Students are required to prepare for lab by reading the experiment background and procedure and completing a pre-lab assignment. Online learning brought our attention to the need for making digital resources accessible, when previously the lab manual documents were not designed with accessibility best practices in mind. These improvements will increase accessibility via screen readers or through the Immersive Reader feature in Canvas.

- Add headers throughout the document for structure
- Add alt text descriptions to images
- Move images, safety warnings, example problems, etc from separate text boxes into the main document structure so that reading order is clearer
- Use MathType to make screen-reader friendly math with MathML descriptions that are transferrable to Canvas
- Ensure all numbered steps in the experiment procedure are in list format

C. Online Pre-lab and Post-lab Assignments

Each of experiments include a pre-lab (done before the experiment) and post-lab (done after the experiment is completed) assignment for students. The questions in these assignments are static and most have not been changed since the last major revisions to the Chem V01AL manual made in 2019. The answers to many of these questions can be found online. I plan to make dynamic online pre-lab and post-lab assignments in MyOpenMath (MOM) that will allow students multiple tries to answer questions correctly and can be used to give students different versions of problem either by changing quantities, chemicals, or reactions in the problem.

MyOpenMath is an open online interactive homework system originally designed for mathematics to provide students with immediate feedback on algorithmically generated questions. MOM has been slowly adopted by a small number of instructors in math-heavy disciplines like chemistry, physics, and engineering. In the past few years, MOM has expanded to support chemistry answers such as chemical formulas, chemical equations, and numerical answers with a specified number of significant figures. Questions in MOM are contributed by faculty volunteers across North America and beyond. MOM is already in use by several math faculty in at VC, MC, and OC, and has been approved for Canvas integration for multiple years. Assignments in MOM can be directly embedded in Canvas for student work.

I already have extensive experience with question writing in MOM. I started using MyOpenMath in spring 2021 to support students in my online Chem V01AL class who needed more immediate feedback on the calculations using the unique data obtained from the virtual lab simulation, Beyond Labz. Students working asynchronously used the MOM assignments to know if they were completing the calculations correctly or if they needed to seek out help from me. I am currently part of a workgroup for an ASCCC OERI-funded project to create a set of online homework questions in MOM and ADAPT, the Libretext OER online homework system, that any chemistry instructor can use for Introductory Chemistry (Chem V20). Chem V20 or high school chemistry is a prerequisite for Chem V01A. There are still a very limited number of Chem V01A-level questions available in MOM, but in the next few years, I hope that contributions from myself through this project and from other chemistry instructors we may be able to switch to using MOM and/or ADAPT and get away from costly publisher homework systems.

D. Development of a Chem V01AL Course Guide for new instructors:

The chemistry department has been hiring 2-3 new adjuncts every year for the past few years. These new hires have had little to no prior experience teaching at a community college. I am planning to put together an official course guide for new instructors based on the new Chem V01AL schedule of experiments. Components of the Experiment Instructor Guides will include:

- Tips for student success: common errors and how to correct or work around them
- Example board notes for presenting the experiment to students
- Expected experimental results
- Safety warnings
- Waste disposal instructions
- Tools for assessing students:
 - Answer keys for each experiment
 - Guidance on evaluating student results
 - Example quizzes for experiments

E. Dissemination of course materials

All of the resources that I create as part of this sabbatical project will be shared in the VCCCD OneDrive with all faculty in the VC Chemistry department. I will also create a Canvas course loaded with the lab manual materials and the online pre-lab and post-lab assignments that chemistry faculty can use as a template for their section of Chem V01A lab.

IV. Value of Sabbatical Project to VCCCD, Ventura College, and Students

CHEM V01A is associated with 27 programs and is a prerequisite for nine courses. Since the return from online labs in Spring 2022, this course has served approximately 425 students per academic year across an average of 19 course sections. Pre- and post-pandemic, this course remains in very high demand and is offered every fall, spring, and summer with fill rates averaging close to or above 100%.

Having one person organize the updates to the OER lab manual well ahead of the curriculum and schedule changes will ensure that students have a consistent experience with the updated Chem V01A course.

VI. Value of Sabbatical Project to Instructor

I have acted as the course lead for Chem V01AL for multiple semesters and have been in charge of minor edits for the Chem V01AL manual in recent years. I am excited to be at the lead for the overhaul of the lab component of Chem V01AL. I look forward to having the time to properly prepare for the major changes so that experienced and new instructors (and the lab technicians!) do not have stress about preparing new materials on the fly and can give students the best experience possible in the course.

Thank you for your time and consideration.

Sincerely,

Erin R. Brocker, PhD
Professor of Chemistry
Ventura College