

## Sabbatical Proposal Spring 2022

### Enhancing General Chemistry Instruction Through the Use of

### Zero Cost Virtual Simulations and Animations

Deanna Franke, Ph.D., Chemistry Department, Moorpark College

#### Instructor Sabbatical Leave Status

Full-Time Hire Date: January 1994

Previous Sabbaticals: 0

#### I. Background

The year 2020 has been a challenge for students and instructors as we moved our Chemistry courses from the classroom and laboratory to home computers in this time of Covid19. Students have developed new technological skills and independence. Virtual simulations and animations enhance chemistry education, even after courses return to on-campus classrooms and laboratories. The amount of technology tools available in chemistry amazing. Low and no cost resources are readily available. Moving to low or zero cost materials supports equity and has been addressed in a recent California state initiative on Zero Textbook Costs (ZTC).

Moorpark College offers about 41 Chemistry courses each semester where half of the offerings are General Chemistry (ChemM01A and ChemM01B), enrolling over 500 students each semester. Classes are in high demand with many sections having filled waitlists. The 5-unit courses satisfy CSU-GE and ICETC general education requirements for physical science, have updated Course Outlines of Record (COR), and have been mapped to and approved by the C-ID system as fully transferable. Each General Chemistry course consists of 4 units of lecture and 1 unit (3 hours) of laboratory practice.

Students struggle with chemistry, especially if presented in a static manner. Traditionally, our department has developed static worksheets for students to solve and answer questions as part of our lab manual. Simulations and animations are useful tools to bring chemistry to life and a deeper understanding of the fundamentals taught in General Chemistry courses. Creating an active learning method, additionally supports our Chemistry Program Goal: *Students participating in the Chemistry program will use the process of scientific inquiry to qualitatively and quantitatively solve chemistry*

*problems by gathering evidential information, analyzing data, forming appropriate conclusions, and communicating these results through written and oral expressions.*

## **II. Purpose of the Sabbatical Project**

Students have moved to online learning in the year 2020, so now they have the resources and practiced the skills to learn virtually. The amount of technology tools available for virtual simulations and animations in chemistry is growing and truly overwhelming, so much available to discover and utilize. In order to use these tools effectively to enhance chemistry courses at Moorpark College and beyond, the goals of this sabbatical include the following five areas.

- 1) Investigate the technology tools available for chemistry virtual simulations and animations available online that are a zero cost to students and instructors.
- 2) Research scholarly articles concerning pedagogical methods and technology in chemistry education to learn best practices.
- 3) Organize and describe available resources and share the findings in a document with other chemistry instructors.
- 4) Choose six to ten topics in the General Chemistry series to create and/or modify activities using simulations and animations that will enhance student learning. The assignments should build critical skills needed for science as determined by the researched articles. These new assignments (ready to use) will be shared on a Chemistry Department Canvas Shell. A goal is to have a cohesive, comprehensive product within the Canvas Shell that is easy to access, disseminate by the professor, and clear for the students to use.
- 5) Additionally, materials developed may be shared with high school and college instructors of General Chemistry through various online groups and individually.

### **Examples of Simulation and Animation Resources available to investigate:**

Source: American Chemical Society

<https://www.acs.org/content/acs/en/education/students/highschool/chemistryclubs/activities/simulations.html>

- [AACT: Simulations](#)

This page is a collection of all the simulations created by the American Association of Chemistry Teachers. Several new simulations are added each year. Every simulation is open for teachers and students to access.

- [ACS Middle School Chemistry: Remote Learning Assignments](#)  
Each assignment contains videos, images, and questions keyed to the ACS Middle School curriculum. Users can copy any of the Google Forms to their Google Drive to edit and use.
- [PhET Interactive Simulations](#)  
PhET, based at the University of Colorado at Boulder, offers over four dozen chemistry-based simulations, many translated into different languages. Search by subject and grade level.
- [MERLOT Materials: Chemistry Simulations](#)  
The Multimedia Educational Resource for Learning and Online Teaching (MERLOT) at the California State University has collected descriptions and links to a huge number of chemistry simulations, with peer review ratings and comments, and information on appropriate grade levels.
- [ChemCollective](#)  
The ChemCollective, organized by a group from Carnegie Mellon, shares virtual labs, simulations, and molecular level visualizations for chemistry (See “Resources by type” in site’s sidebar.)
- [Mixed Reception](#)  
This ChemCollective activity could be described as a murder mystery for chemistry students. “Interview” suspects by viewing videos, investigate the crime scene using images, and analyze evidence from the crime lab.
- [Aspirin Screen Experiment](#)  
Explore the chemistry of aspirin virtually with four levels of experiments, including synthesis, thin layer chromatography, and reaction conditions.
- [CK-12 Chemistry Simulations](#)  
Nearly two dozen simulations cover topics like average atomic mass, solubility with rock candy, and freezing point depression with road salt.
- [Titration Screen Experiment](#)  
Give students titration practice virtually.
- [goREACT](#)  
This drag-and-drop periodic table environment from Chicago’s Museum of Science and Industry lets you experiment with different element combinations.

- [Molecular Workbench](#)  
Browse “showcase” chemistry simulations, with many more available in the library. It also has tools for teachers and students to create their own.
- [ChemReaX](#)  
Users can model and simulate chemical reactions, focusing on thermodynamics, equilibrium, kinetics, and acid–base titrations, with accompanying virtual lab exercises. It is designed for high school (AP/IB) and undergraduate students and teachers.
- [General/Introductory Chemistry: Simulations](#)  
This page, maintained by chemistry professor William Vining, has simulations that cover a wide range of chemistry concepts.
- [Simulations for Chemistry](#)  
Professor Gary L. Bertrand’s (University of Missouri–Rolla) page offers many simulated experiments, such as “The Case of the Five Droppers,” a virtual presentation of five reagents being combined in different ways.
- [Collisions Chemistry](#)  
Collisions is a system of digital games, grounded in the rules of chemistry, that can be used to introduce, teach, and review key concepts in your chemistry classroom.

**Proposed timeline:**

**January 2022:** Investigate the technology tools available for chemistry virtual simulations and animations available online at zero cost to students and instructors. Research scholarly articles concerning pedagogical methods and technology in chemistry education to learn best practices.

**February/March 2022:** Organize and describe available resources and create a document to be shared with other chemistry instructors. Choose six to ten topics to investigate further and begin to create student assignments appropriate for use to enhance student learning in our General Chemistry series.

**April 2022:** Have several faculty and students review and follow the assignments as designed. Encourage feedback and improve as needed. Build connections and community through joining online chemistry education groups and reaching out to local college and high school chemistry teachers. Continue reviewing, learning, sharing and developing.

**May 2022:** Create a Canvas Shell to store these new assignments (ready to use) and give access to Chemistry faculty at Moorpark College so they may import assignments for use in their own class Canvas shells. Create a document with the assignments and links that may be shared. Additionally, share materials beyond Moorpark College with high school and college instructors of General Chemistry through various online groups and individually.

**Achievability:**

This timeline is flexible enough to allow expansion, and realistic enough to accomplish in one semester. Material cost is negligible, as the plan involves research of zero cost simulations and scholarly publications that are available with zero or minimal costs through on-line investigations. Once establishing the shared Canvas Shell of “active learning” at the completion of the Sabbatical, I imagine it can be maintained, added to and revised to stay up to date.

**III. Value of Sabbatical Project to students, Moorpark College and to VCCCD**

**Students:**

The mission statement of Moorpark College is “With a ‘students first’ philosophy, Moorpark College empowers its diverse community of learners to complete their goals for academic transfer, basic skills, and career education. Moorpark College integrates instruction and student services, collaborates with industry and educational partners, and promotes a global perspective.”

Visualizing chemistry using virtual simulations and animations with thoughtfully developed assignments enhance students’ learning of the fundamentals of General Chemistry. The virtual platform allows students to learn and discover at their own pace and at zero cost. Zero cost opens the opportunities up for all students from diverse communities to have the opportunity to participate and learn. This is putting “students first”, as stated in Moorpark College’s mission statement.

**College:**

The result of this sabbatical has value to the college. Chemistry instructors will have access to a Chemistry Department Canvas Shell providing resources useful to enhance the teaching of General Chemistry that includes:

- A) an organized and descriptive document that describes available resources

B) pre-built “ready to use” assignments for six to ten topics in the General Chemistry series using simulations and animations that will enhance student learning. The assignments will build critical skills needed for science and use “best practices” as determined by researched articles.

It is also my hope that once faculty see the available resources and what is possible, they will support further development and be inspired to create additional resources for General Chemistry and our other chemistry courses offered at Moorpark College.

**District:**

The district’s mission is that it “provides students, in its diverse community, with access to comprehensive quality educational opportunities that support student learning and student success.”

A goal of this sabbatical is to create zero cost resources that improve the student experience with “comprehensive quality educational opportunities that support student learning and student success”, as stated in district’s mission statement.

Materials developed during the sabbatical may be shared with high school and college instructors of General Chemistry through various online groups and individually. Additionally, the resources and Canvas shell may be shared with faculty at our sister colleges in Ventura and Oxnard.

**IV. Benefit to the candidate**

I have been teaching introductory and general chemistry courses at Moorpark College for 27 years. I have mainly taught in a traditional lecture style for much of that time, slowly changing to add technology. Approximately ten years ago, I added mandatory online homework and a class website. Currently, I am teaching courses through Canvas filled with modules, but primarily presenting much of the material in a lecture based format through ConferZoom. The move to online/hybrid teaching has added virtual labs to my courses. I have only the time to work with paid simulations, specifically Labster and BeyondLabz. Free resources generally have inconsistent quality. There is no time to review free resources in a comprehensive manner. I look forward to having the time to research the current/new available resources and best practices. I desire to update my knowledge and skills so that I may replace “static” questions on a worksheet with “active” assignments that use simulations and animations, which teach students in a modern way. I believe many new sources are developing due to the tremendous online teaching during Covid19. Designing and creating assignments that use available, zero cost, animated simulations will create new experiences for students. I see a need to update my

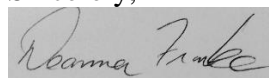
knowledge and skillset to meet the challenges of teaching students the fundamentals of General Chemistry in a modern way.

## V. Conclusion

In the 53 year history of Moorpark College there have been three faculty granted a sabbatical from my department that I am aware of 1) Dr. Robert Miller chemistry/environmental science in the early 1980's, long before my arrival, 2) Lori Clark, environmental technologies, Spring 2013 and 3) Dr. Robert Keil chemistry, Fall 2020. I am not aware of any others from my department or division (currently my division is **Science and CTE**) during my 27 years teaching at Moorpark College.

My colleagues and department chair support this sabbatical plan. A high school teacher in the local area, additionally supports the idea. I have attached letters of support. The creation of this online resource with a shared Canvas Shell for instructors to have "ready to use" assignments and organizing a resources document will be of great benefit to the students and Chemistry faculty. Additionally, sharing the results may extend beyond Moorpark College to other college and high school faculty and teachers of General Chemistry. The resources developed may also be useful in other sciences, such as Physics and Biology. This goal is reasonable, useful, and achievable in a semester. Thank you for your consideration.

Sincerely,



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October 30, 2020

Dear Sabbatical Leave Committee,

I would like to strongly and enthusiastically recommend Deanna Franke for sabbatical leave. Her proposed project is extremely valuable to our department, our students, the college and district. Every faculty in our department assigns worksheet practice problems in addition to traditional graded homework. These worksheets are very static and frankly boring. The new activities Deanna will create will provide students with engaging and free active learning activities. These will be easily shared with other faculty in the district and other regional high school and college chemistry faculty at the Annual Collaborative Chemistry Conference and the Two-Year College Chemistry Consortium Conference.

Deanna has been teaching at Moorpark College for 27 years. During this time she has been an outstanding instructor and an active participant in service to our department, college, and the community. She has never received a previous sabbatical, and we have had only 1 recent sabbatical in our department and division. Deanna is a very deserving candidate, and I strongly support her proposal for sabbatical.

Sincerely,

Tiffany Pawluk  
Department Chair  
Chemistry Department  
Academic Senate Vice President  
Moorpark College





MOORPARK COLLEGE

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805 378 1400

October 31, 2020

Dear members of the sabbatical committee,

I am writing this letter in support of Deanna Franke's application for a sabbatical.

With so many changes happening in the 2020 year, we are all uncertain of what the future semesters will be like. It seems extremely likely that the use of on-line content and active learning software will continue to become common after all students have spent at least a year using them. Having a centralized resource that our department could draw on would be a great benefit both our adjunct and full-time faculty. Prof. Franke's proposal would create that resource and would benefit the department.

Prof. Franke is a well-respected by her fellow faculty and is an integral part of the department. As a former chair, she has shown that she can lead the faculty and that the fruits of her labor will go to good use after she has completed her sabbatical. Based on her proposal and her experience, I enthusiastically support her application for a sabbatical appointment.

Sincerely,

A handwritten signature in black ink that reads "R. Keil".

Prof. Robert Keil, Ph.D.  
Chair of Chemistry  
Moorpark College

October 30, 2020



Re: Letter of Support for Professor Deanna Franke's 2022 Sabbatical Proposal

To the Members of the VCCCD Sabbatical Committee,

I am writing this letter in support of Dr. Deanna Franke's spring 2022 sabbatical proposal to enhance general chemistry instruction through the use of zero cost virtual simulations and animations. She is very qualified. After teaching chemistry at Moorpark for 27 years, she knows where the typical chemistry student struggles and would benefit from the additional support that simulation and animation would provide.

I currently teach high school chemistry and biology and have taught summer sessions of physical geology at Moorpark college. During this pandemic, all teachers have been struggling with finding new ways to explain and enhance the learning experience for students. There is a great need to review and evaluate simulations and animations that are available and accessible to all. Simulations that are of value typically need to have additional explanation, directions and questions added to be usable by students.

I believe that her proposal is of reasonable scope to be accomplished in a semester and would be of great value to not only the Moorpark college chemistry department but would be of value for the AP, honors and college preparatory class at the high school level.

Annette Berry, M.S.  
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