

**Ventura College Sabbatical Leave Report**  
**Microbiology Lab OER Project for Fall 2020**  
**Submitted by Jennifer Garner**  
**Biology Department**

Instructor's Sabbatical Leave Status

Full-Time Hire Date: January 2014

Previous Leaves: 0

Sabbatical Taken: Fall 2020

**I. Summary of the Project**

**❓ Disruption of Planned Project**

The proposed project was to produce a digital microbiology atlas containing instructional images for both the MICR V01 Introduction to Microbiology and the brand new MICR V39 Food Microbiology course that will be offered for the first time in Spring 2021. **This sabbatical project was necessarily modified because of COVID Pandemic restrictions and subsequent closure of the Ventura College Science Building labs for HVAC construction throughout the 2020-2021 academic year.**

The digital photographic atlas project depended on the ability to generate data using all bacterial strains and microscope, biochemical, and cultural tests available in the Ventura College microbiology lab. The rapid move to remote learning in Spring 2020 resulted in an immediate need for bacterial biochemical test data. Students had begun the unknown organism identification project in person but needed to complete their projects virtually.

With the support of Sheena Billock, VC Biology Instructional Lab Technician, I was able to generate and photograph nearly 130 test results from the 13 different bacterial species using multiple differential media types cultured by Ms. Billock. A week of testing, photography and editing provided enough data to support all VC microbiology students in completion of the unknown organism project that semester. These data photos were freely shared with other VC MICR V01 instructors, and generally on Canvas Commons, and will continue to be used for the benefit of VC students in on-campus and online labs moving forward.

This data will form a substantial portion of a digital lab atlas but is not sufficient for a complete resource. The closure of the building prevented generation of data for other necessary photographs. The digital lab atlas project is on hold until a future time when data can be generated, and time is available to develop the photographs into an OER photographic atlas. It is possible in the meantime that another OER photographic atlas will become available, making the project unnecessary.

**❓ Project Redesign**

Remote learning brought many opportunities for professional development and exploration of distance education options for science labs. The primary objective for lab courses is a hands-on approach for discovery-based learning. The state, district, and college provided funds for access to virtual simulation resources, which was necessary for many courses. However, the concern about validity of online labs in the pre-allied health prerequisite courses has led to pre-pandemic development of commercial kits for

microbiology. As such, at-home, hands-on experiments are desirable as well as being very practical for General Microbiology students.

At home lab kits were used for all VC MICR V01 labs from Summer 2020 through Fall 2021. In Summer 2020, students purchased commercial lab kits. Commercial lab kits are expensive but can be delivered directly to students at home and do not require students to have transportation to, or even live in the Ventura College area. Starting in Fall 2020, instructional lab technicians created lab kits for free check-out to students. The free lab kits allowed the online MICR V01 courses to be Zero Textbook Cost (if instructors transitioned to the OER text) but restricted course enrollment to students living within a reasonable distance and having transportation to campus. There were several VC students living with family out of state that were unable to take the course because they could not come to campus to check out the kits. The free kit check-out will be discontinued in Spring 2022 due to staffing constraints.

At-home lab kits and microscopes allow students to meet all COR requirements for the lab portion of MICRV01. This includes growing bacteria at home and learning techniques for at-home lab safety, disinfection, aseptic technique, and observing bacteria under the microscope. Students have two main concerns with DE labs: 1) isolation from instructor and lab mates and 2) contamination of the home environment with bacteria from the experiments. Members of students' households usually also have concerns about safety and contamination of the home environment with bacteria from the experiments.

The goal of the sabbatical project redesign was to develop experiments that could be performed at home, for low cost, that also lowered anxiety about safety. Student concern about performing experiments in isolation has been and will continue to be addressed using DE course design elements for collaborative learning.

## II. Components of the Sabbatical Project

- ☐ Identification of reliable food safe sources for robust microbes that are culturable in at-home growth conditions (Critical need for cultural microbes that include both eukaryotic (yeast) and prokaryotic (bacteria) species as well as both Gram positive and Gram negative bacterial species.
  - i. *Saccharomyces cerevisiae* (baker'/brewer's yeast)
  - ii. *Lactobacillus* bacterial species – Gram positive bacilli (“Live active culture” in yogurt and probiotic drinks: e.g. Yakult®, Good Belly®.)
  - iii. *Acetobacter* bacterial species - Gram negative bacilli (Raw or “Live active culture” kombucha)
  - iv. Wild-captured sourdough starter (combination of yeast and most frequently Gram positive bacterial species from a variety of genera.)
- ☐ Characterization of food safe microbes
  - i. Simple stain - size, morphology and cellular arrangement
  - ii. Gram stain - bacterial cell wall composition (not relevant for yeast cell wall composition)
  - iii. Growth optimization – media composition, temperature, time requirements
  - iv. Characterization – biochemical tests (differential media, fermentation, catalase activity)

- ☐ Alignment with lab activities that meet COR requirements
  - i. Aseptic technique
    - 1. Inoculation of broth cultures
    - 2. Inoculation of agar slant cultures
  - ii. Isolation of bacteria from environmental samples
    - 1. Streak plate for isolation from mixed cultures
    - 2. Subculture to create pure cultures
  - iii. Bacterial enumeration
    - 1. Serial dilution
    - 2. Standard plate count
  - iv. Smear preparation
  - v. Staining
    - 1. Morphological
    - 2. Differential
  - vi. Microscopy – use and care
  - vii. Differential media
  - viii. Biochemical tests
  - ix. Sample and identify microorganisms from fomites and other sources
    - 1. Culture and isolation of wild sourdough starter
    - 2. Identification of yeast versus bacteria via staining

### III. Impact of Sabbatical Project to VCCCD and Ventura College

The data collected in the experiments of this project provide exciting options for hands-on lab activities for students at Ventura College and within the district. These options can be offered based on the balance of priorities of the following criteria.

- Zero cost
  - In-house lab kits checked out to students
  - VC microscope lending library
- Low cost
  - Student-purchased food-safe microbe sources and media from popular vendors (*e.g.* Amazon)
  - VC microscope lending library or student-purchased microscopes (relatively low cost from popular vendors)
- Increased accessibility (time and location)
  - Commercial lab kits/microscopes
  - Student-purchased food-safe microbe sources and media from popular vendors and microscopes
- Safety (perception of the lay person)
  - Student-purchased food-safe microbe sources and media from popular vendors and microscopes

### IV. Impact of Sabbatical Project on Students

Use of food-safe microbes goes a long way to reduce the anxiety felt by students and members of their households when conducting microbiology lab experiments at home. This perception is based on sourcing the microbes from grocery items with which the students are already familiar.

The lab strains provided in the in-house and commercial lab kits for growth in at-home lab experiments are all Risk Group Level 1 (RG1) organisms. These are defined by the National Institute of Health (NIH) as “agents that are not associated with disease in healthy adult humans.” However, there is a certain amount of suspicion and fear associated with growing bacteria at home that were sourced in a scientific laboratory. There is value in reducing anxiety in the learning process, whatever the cause.

However, there are reasons that the use of food safe microbes will not be implemented immediately at Ventura College. There are problems with equity in having access to food products that reliably contain safe culturable microbes with the characteristics required for the at-home lab experiments.

As a community college, many of our students come from financially disadvantaged backgrounds. Many of the food items with high reliability for the food safe microbes are only easily found in specialty or high-end grocery stores. Students may live in areas that are effectively “food deserts” or that do not carry specialty items. Requiring students to travel to find the food items outside of the neighborhoods in which they live and/or work could present a hardship.

To design DE microbiology labs in a culturally responsive way, it is critical to be aware of the availability of materials to students to meet the Ventura College guiding principle of designing student-centered solutions.

#### **V. Impact of Sabbatical Project to Instructor**

An unexpected benefit of the COVID-19 Pandemic restrictions was the sudden availability of online conferences, seminars and workshops free of charge. My sabbatical gave me time to participate in many AJEDI and STEM focused professional development events including:

- The Teaching Professor Virtual Conference
- HI-TEC 2020 Transformed Conference
- CVC.OEI Achieving Equity in STEM through Authentic Assessments
- American Society for Microbiology College-University Education Annual Conference
- Center for Urban Education of the Race and Equity Center at USC, 2020 Fall racially equitable practices in education seminar series
- CORA Webinars
  - Black Minds Matter
  - Equity in Education
- Foothill College Equity Seminar Series
  - Angela Davis
  - Knatokie Ford
- Tiny Earthy Partner Instructor
  - TEPI Certification
  - Ongoing community of practice
  - College Undergraduate Research-based Education (CURE)
- ACUE Creating an Inclusive and Supportive Online Learning Environment micro credential

My sabbatical research project and professional development trainings have influenced my teaching philosophy such that I am designing strategies for equitable access to discovery, research opportunity, and leadership development in my face-to-face and DE courses going forward.

#### **VI. Future of the Project**

The project results and professional development activities from my sabbatical will be applied in these ways:

1. Potential for use of food-safe microbe sources for in-house microbiology lab kits, free for student check-out, if staffing power allows.
2. Resources for at-home lab activities in response to emergency remote-learning
3. Plan for incorporation of undergraduate research-based learning in face-to-face microbiology lab activities as an act of justice in providing research opportunities for Ventura College students whose access to this kind of resume building experience has been limited by systemic racism in the education system, and whose life-demands or know-how prevent them from seeking out research experience or internships which are generally unpaid and out of the Ventura area.
4. Ongoing review of course design and laboratory exercises for cultural responsiveness to improve equity and inclusion.

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