

Implementation and Evaluation of a Virtual Microbiology Laboratory for Pharmacy Students

Katherine Gruenberg, PharmD, MAEd¹; Trang Trinh, PharmD, MPH¹; Elizabeth Joyce, PhD²; Conan MacDougall, PharmD, MAS¹

¹Department of Clinical Pharmacy, UCSF School of Pharmacy; ²Department of Microbiology and Immunology, UCSF School of Medicine

Introduction

- Health professions students require a solid foundation in medical microbiology for the clinical management of infectious diseases.
- Students commonly learn microbiology concepts during in-person laboratories.
- While highly rated by students, laboratories are extremely resource- and time-intensive.
- A virtual microbiology lab (VML) may minimize resource utilization while maintaining educational value.

Study Aim

- We report on the implementation and evaluation of a VML designed to teach clinical microbiology to second-year pharmacy students in an infectious diseases course.

Methods

- The VML introduced students to major clinical microbiology concepts, such as obtaining samples, identifying pathogens, testing susceptibilities, and reporting results.
- We created a video in our clinical microbiology lab to depict the steps involved in processing and analyzing a patient sample.
- We also designed two online interactive modules for students to practice lab techniques, such as streaking an agar plate.
- Students viewed the video and completed the modules prior to attending a two-hour in-person, case-based, small group discussion.
- All students were invited to complete a post-session evaluation that assessed achievement of session objectives and ratings of materials.

Microbiology Lab Video

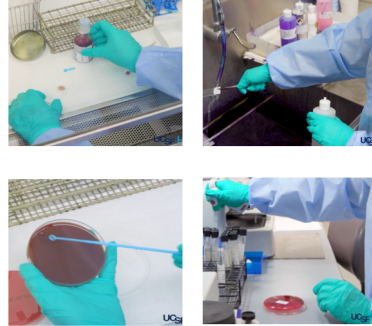


Table 1: Students' Quality Ratings of Instructional Materials

Instructional Materials	Number of responses N (%)	Mean Rating (SD)*
Preparatory microbiology lab video	68 (99)	3.28 (0.68)
Preparatory online modules	68 (99)	3.31 (0.73)
In-class cases	67 (97)	3.25 (0.61)

*Students rated quality on a 4-point scale, where 4 = excellent

Online Interactive Modules

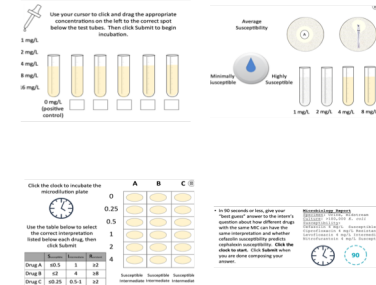


Table 2: Students' Self-Reported Achievement of Objectives

Description of Objective	Number of responses N (%)	Mean Rating (SD)*
Explain the steps involved in a clinical microbiology lab.	69 (100)	2.36 (0.74)
Select definitive antibiotics based on susceptibility report.	68 (99)	3.13 (0.59)
Interpret microbiology culture results for decision-making	68 (99)	3.07 (0.6)
Explain role of Gram stains in identifying and differentiating bacteria.	69 (100)	3.29 (0.51)
Determine whether empiric antibiotics are appropriate based on an antibiogram.	68 (99)	3.09 (0.56)

*Students rated agreement on a 4-point scale, where 4 = strongly agree

Results

- Sixty-nine students (65%) completed the evaluation.
- Students highly rated the video, modules, and in-class cases (Table 1).
- Fewer students felt confident explaining the clinical microbiology process, compared to selecting antibiotics, interpreting cultures, explaining Gram stains, and interpreting an antibiogram (Table 2).
- Free-text comments highlighted the value of the video, modules, and instructor facilitation during the in-class session.
- Students suggested improvements with the module user interface and reinforcement of certain topics (e.g., susceptibility breakpoints) during the in-class session.

Conclusions

- We demonstrated successful implementation of a VML within a pharmacy course.
- We plan to refine the VML next year and measure its association with student performance on summative examinations.
- To facilitate the adaptation of VMLs by other schools, our teaching materials are freely available at:
 - Video: <https://vimeo.com/390087512>
 - Modules: <http://tiny.ucsf.edu/atlas>

Acknowledgements

This work was funded by the UCSF Academic Senate and School of Pharmacy Faculty Council Learning and Development Award.

Presenting Author's Email: Katherine.Gruenberg@ucsf.edu