# Transitioning Biology Laboratory Online: An Instructor's Experience & Reflection

**Mandy Biggers, Ph.D. and Shazia Ahmed, Ph.D.**

## Abstract

During spring 2020, fall 2021, and spring 2021 we transitioned our formerly face-to-face biology for majors lab (BIOL 1111 – Principles of Biology I) to an online format. We had many periods of trial and error, and have learned quite a bit along the way. This poster shares the pros and cons of three different methods we used in our attempt to simulate hands-on instruction for our students: (1) pre-existing, pre-packaged purchased online lab programs, (2) pre-existing free online simulations, and (3) modifying our existing activities for students to do at home. We found a continuum of experiences in the instructional value, delivery method, ease of use, and student success.

## Introduction

Virtual labs have been around for more than a decade but their adoption has been slow in core sciences (Scheckler, 2003; Huang, 2004; Yaron et al., 2010). In an earlier study (Rajendran et al., 2010) highlighted the utility of virtual labs. 92% students in this study preferred participating virtual labs because they felt virtual labs were safer. Another study found that virtual labs motivated students, these learn-by doing activates engaged students, increase long term understanding and increased student confidence in performing in-person labs (Coleman & Smith 2019).

A this points we in hard core science had no choice but to acknowledge the virtue of online labs as cost effective, safer place to make mistakes(no explosions), and interactive platform for labs. We were also forced to reluctantly admit that they were here to stay (Jones, 2018; Glassey & Magalhaes, 2020)) but we considered them to be supplements and pre-labs. We held true to our prejudice that 'if you are not physically doing it you are missing the experience', after all cutting through a pig is not the same as a click of the mouse. But then came Covid and we were 100% online in the matter of 15 days! We scrambled to search and adopt material to deliver online labs.

Texas Woman's University is known for value education and we do not have enormous private endowments. Therefore, we were not in the position to adopt all virtual lab pre-packaged from leading providers such as Labster. Also, the various levels of instructions we required asked for some customization. As a solution we took three approaches. We adopted some commercial, we found some and we made some.

(we are here to reflect on our experience of these three

## Pros & Cons of Online Lab Resources

### 3 MODELS OF INSTRUCTION

PROS CONS

### Pre-Existing, Paid Online Labs

- Easy to integrate into LMS
- Done-For-You Option
- Modules match content
- Gradebook integration
- No lab preparation necessary
- consistent expectations

Labster · Beyond Labz · Mc Graw Hill · LabX · mastery

- Cost to students ($50+)
- Rigor doesn't always match
  - majors vs. non-majors
  - 1000 level vs. 4000 level course

### Pre-Existing, Free Online Labs

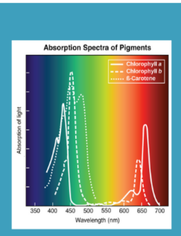
- Done-For-You (if you find them)
- Simulations on any topic
- No physical prep
- Free for students

THE NOBEL PRIZE · NCBI · Pearson · hhmi BioInteractive · The Concord Consortium

- Searching for matching content is time consuming
- Student submissions complicated and different for each site
- No gradebook integration

### Modified Activities from Our Curriculum

- Matches our curriculum perfectly
- Comfortable and familiar
- Experimental design





ESCAPE ROOM

- Students don't always have materials
- Grading takes time

## TRANSITIONING BIOLOGY LABS ONLINE

## Our Reflection

We appreciated the ease of use of the pre-existing lab simulations. They integrated into the gradebook seamlessly, and saved time on the instructor work load. However, the cost to students is our the limiting factor with this format. Also, the level of rigor for the activities we wanted to use did not always align. The free version required more instructor involvement because the grades had to be manually entered. And the in-house modification assignments required the most instructor time and effort. But they were custom-designed for our course and therefore aligned with our level of rigor.

## References

Coleman, S. & C. Smith. (2019). Evaluating the benefits of virtual training for bioscience students, Higher Education Pedagogies, 4(1), 287-299

Glassey, J., & Magalhães, F. D. (2020). Virtual labs – love them or hate them, they are likely to be used more in the future. *Education for Chemical Engineers*, *33*, 76–77. https://doi.org/10.1016/j.ece.2020.07.005

Huang, C. (2004). Virtual Labs: E-Learning for Tomorrow. PLoS Biol. 2(6), e157

Jones, N. (2018). Simulated labs are booming. Nature. 562, S5-S7

Rajendran, L., Veilumuthu, R., & J. Divya. (2010). A study on the effectiveness of virtual lab in E-learning. Int. J. Computer Science and Engineering. 2(6), 2173-2175

Scheckler, R. (2003). Virtual Labs: A substitute for traditional labs? Int. J. Dev Biol. 47: 231-236

Yaron, D., Karabino, M., Lange, D., Greeno, J., & G. Leinhardth. (2010). The ChemCollective-Virtual Labs for Introductory Chemistry courses. Science, 328, 584-585

## Acknowledgements

The authors thank our brain storming colleagues, Dr. Mary Berger, Dr. Syeda Salam, and Ms. Jayme Collier during the online transition of Biology labs. We would also like to thank Dr. Juliet Spencer, Chair Biology for her unyielding support.