Academic Continuity

Conversations with Program Reviewers (CPR)
May 5, 2020

Academic Programs Team
Campus Reviewer Contact Information:
https://system.suny.edu/academic-affairs/acaproplan/app/find-your-campus-reviewer/
Today’s Topic:
Reimagining Laboratory Learning via Remote Instruction

- Phillip Ortiz, Assistant Provost for Undergrad and STEM Education, SUNY
- Kim Scalzo, Director of Academic Technologies & Innovation, Open SUNY
- Jennifer A. Herzog, M.Phil., M.S., Associate Professor of Biology, Director of the College Honors Program, Herkimer College
- Mary V. Mawn, Ph.D., M.Ed.; Dean | Science, Mathematics, and Technology; SUNY Empire State College
- Alexa Silva, Ph.D., Director of Instruction and Outreach, Department of Chemistry, Binghamton University
Reimagining Laboratory Learning via Remote Instruction

Phillip Ortiz, Ph.D.
Assistant Provost
Undergraduate and STEM Education
SUNY
“It’s all about the learning outcomes!”

• Is this an opportunity to rethink laboratory learning, i.e., the goals and the means?

• There’s no doubt that hands-on learning is an essential part of STEM education.

• There are learning outcomes that have traditionally been delivered via a number of settings...
  • Field work (ecology, geology, engineering), wet labs (biology, chemistry), apparatus (physics, chemistry), circuitry (CS), robotics, etc.
Learning outcomes

• Which matters more -- what you know, or how you came to know it?
• Are there other ways to achieve those same outcomes?
How do you define remote instruction?

- Consider which parts of a learning experience require a campus lab, versus other opportunities.

- For example, does it matter if prior to going into the field the instructions are given orally, written, email, LMS?
  - Does it affect the learning outcomes?
  - The key qualities are that students receive instruction, engage in the authentic learning exercise, and they receive timely help, guidance, formative feedback, and summative assessment.
Is remote learning necessary or sufficient?

• In some topics (not “fields”) non-experiential learning is not sufficient. For example, who wants to be a passenger in a car with someone who has only used a driving simulator?

• But, in others simulations are an essential part of learning a complex skill -- e.g., the tugboat simulator at SUNY Maritime or commercial pilots who do a significant part of their training in simulators.
Might remote instruction have advantages?

- Rather than spending that time on data collection as is often done in a lab period...

In labs taught via remote instruction, students may be given the opportunity to spend more time on experimental design, data analysis and hypothesis generation and revision.
Reimagining Laboratory Learning via Remote Instruction

Kim Scalzo
Director of Academic Technologies & Innovation
Open SUNY
COVID19 Remote Instruction Site
http://innovate.suny.edu/COVID19

Faculty and Staff Resources/Info
- Resource Collections and Guides
- Webinars and Trainings
- Faculty Support Drop-in Sessions
- Discipline-specific Workplace Groups
Reimagining Laboratory Learning via Remote Instruction

Jennifer A. Herzog, M.Phil., M.S.
Associate Professor of Biology
Director of the College Honors Program
Herkimer College
Herkimer College Snap Shot:

• 2-year community college
• 100- and 200-level laboratory science courses
• Audience mainly General Studies majors (100 level courses) and Pre-nursing students (200 level courses)

We were in a unique position to be able to convert FTF content to remote learning due to years of award-winning experience

• Internet Academy created in 1999
• First online science laboratory course delivered Fall 2002
• Over a dozen 100/200 level lab courses now offered regularly
Learning Outcomes:
Students will demonstrate appropriate use of microbiological and molecular lab equipment and methods.
Students will demonstrate safe microbiology practices, using appropriate protective and emergency procedures.

REMOTE LEARNING ACTIVITIES/ASSESSMENT:
- Student reads lab manual with demo hyperlinks
- Student uses a virtual streak plating tool and narrates/records each step they perform
- Student uses basic disposable tools and cut out simulations to narrate/record steps of protocol
- Student answers critical thinking questions to troubleshoot images of incorrect methods
- Student uses technology (i.e. Paint, scanners, photography) to document and transmit data (i.e. LMS, private YouTube channel)
Learning Outcome:
Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).

REMOTE LEARNING ACTIVITY/ASSESSMENT:
- Student reads lab manual with demo hyperlinks
- Student uses a virtual microscope tool and narrates/records each step they perform
- Student uses basic disposable tools and cut out simulations to narrate/record the steps of each protocol
- Student answers critical thinking questions to troubleshoot images of incorrect methods
- Student uses technology (i.e. Paint, scanners, photography) to document and transmit data (i.e. LMS, private YouTube) channel
Informal “Lab Chat” area is ESSENTIAL to laboratory courses

Jennifer Herzog
How are you doing?
So the most important part of lab 3 is understanding aseptic technique: how to keep your pure stock cultures pure and not introduce contamination...and not contaminate yourself.
Can you think about why I have chosen not to have you work with microorganisms in your home?

RE: How are you doing?
I am doing great! I am actually enjoying performing these labs, never would have thought I would.
After performing the mock lab with “microorganisms” it is a messy procedure and I realize that dealing with bacteria and not having the proper disposals could be very risky especially when introducing new bacteria into our homes.
YUCK!

Jennifer Herzog
How are we doing with microscopy?
so is the light microscope the most powerful a microbiologist can use—why or why not?

RE: How are we doing with microscopy?
No, the electron microscope is much more powerful than a light microscope. The light source is different—an electron microscope uses a beam of electrons to visualize an object.

Jennifer Herzog
Much higher resolution and magnification right?
so what is the difference between SEM and TEM?
Encourage faculty to understand that learning is driven by the existing student learning outcomes, not by the modality of teaching
• this is a good time for many to review course outlines to ensure they effectively state what students need to demonstrate within a course

Demonstrate to faculty that remote learning lab courses are effective and need to be recognized equivalents to FTF lab courses
• provide college-sponsored workshop opportunities led by experienced remote learning faculty
• maintain funding for both college- and faculty-identified professional development opportunities
• create a repository for faculty containing a variety of resources on the development, assessment and effectiveness of remote learning

Support faculty in their pursuit to utilize novel methods to convey a hands-on learning environment in a remote learning setting
• provide support through lab managers, the bookstore to supply for purchase kits or items
• utilize departmental funds to send low-tech, low-cost items to students
• maintain subscriptions to valuable virtual simulations, video sources (i.e. JoVE)
• encourage a working partnership with IT to create effective platforms to facilitate remote delivery
The Big Question is ...

• How can we “bring the laboratory home” and provide students with authentic and rigorous laboratory experiences that address relevant course objectives and learning outcomes?
Hofstein and Lunetta (2004) proposed five learning goals:

• understanding of scientific concepts,
• interest and motivation,
• scientific practical skills and problem-solving abilities,
• scientific habits of mind, and
• understanding of the nature of science.
## SUNY ESC Courses with Remote Labs

### Lab Kits
- Biology I
- Biology II
- Chemistry I
- Chemistry II
- Physics I
- Physics II
- Microbiology
- Anatomy and Physiology I
- Anatomy and Physiology II
- Organic Chemistry I *
- Historical Geology

### Field Work
- Ornithology *
- Biology of Ecosystems
- Winter Ecology
- Plant Ecology *
- Contemporary Environmental Issues *
- The Science of Cooking
- Ethnobotany *
- Marine Biology *
- Introduction to Geology

### Virtual Labs
- Genetics *
- Cell Biology *
- Evolution: One Long Argument *
- Molecular Biology *
- Biology of the Brain *
- Biochemistry *
- Genomics and You
- Introduction to Astronomy
- Molecular Biotechnology *
- Organic Chemistry II *
- Immunology *
Science at the Advanced Level

Knowledge:
- Define, Identify, Describe, Recognize, Tell, Explain, Recite, Memorize, Illustrate, Quote

Understand:
- Summarize, Interpret, Classify, Compare, Contrast, Infer, Relate, Extract, Paraphrase, Cite

Apply:
- Solve, Change, Relate, Complete, Use, Sketch, Teach, Articulate, Discover, Transfer

Analyze:
- Contrast, Connect, Relate, Devise, Correlate, Illustrate, Distill, Conclude, Categorize, Take Apart

Evaluate:
- Criticize, Reframe, Judge, Defend, Appraise, Value, Prioritize, Plan, Grade, Reframe

Create:
- Design, Modify, Role-Play, Develop, Rewrite, Pivot, Modify, Collaborate, Invent, Write

BIOL 3204: Genetics

Upon successful course completion, students will be able to:

- Describe advanced biological concepts related to classical and modern genetics, including Mendelian genetic principles, chromosome structure and mapping, molecular genetics, and techniques in genetics and biotechnology.

- Apply the scientific method through observation, experimentation, evaluation of evidence, construction of hypotheses, and application of theories.

- Critically analyze and discuss findings reported in genetics research articles.

https://sciencecourseware.org/FlyLabJS/
BIOL 4304: Ornithology

Upon successful course completion, students will be able to:

• **Apply field identification techniques to identify birds by characteristics** such as size, shape, color, markings, flight patterns, habitat, behavior, and vocalizations.

• **Compare avian anatomy and physiology to the structure of other vertebrates** and explain the mechanism of flight and orientations/navigation during migration.

• Identify and describe bird behaviors and various avian reproductive strategies.

• Compare avian habitats and the roles of birds in different ecosystems.

https://i.pinimg.com/originals/c6/62/c3/c662c339edd9109981b6c90f2467c70d.jpg
Supporting the Move to Remote Teaching

• Foster a **culture of innovation** (collaboration, experimentation, dissemination)
• Support the **scholarship of teaching and learning** / discipline-based educational research
• Provide opportunities for **pedagogical growth**
  – On-campus professionals can assist with learning outcomes, assessments, OERs
  • Center for Teaching/Learning, instructional designers, educational technologists, librarians
  – Webinars (structured and open-ended)
• **Re-envision** classroom-based instruction (flipped, etc.)
• Support **connections to societies** (scientific, educational, higher ed)
  – Discipline-specific expertise
  – Educational offices within societies
  – Networking with colleagues
  – Virtual conferences
• **Recognize excellence** through articles, awards, etc.

Reimagining Laboratory
Learning via Remote Instruction

Alexsa Silva, Ph.D.
Director of Instruction and Outreach
Department of Chemistry
Binghamton University
The quest to effectively teach an upper level experimental chemistry course via remote instruction
• Spring 2020 quick transition to online lab exercises
  – Videos, voiceovers, datasets
  – No live component (other than office hours), rapid production

• Fall 2020?
Learning Outcomes for Instrumental Analysis

1. Understand and be able to apply the basic principles for instrumental methods in chemical analyses
2. Demonstrate competency in analytical thinking and skills in instrumental approach
3. Demonstrate understanding of the experiment/ analysis by proposing future steps required to further the goals of the experiment
4. Communicate results and ideas clearly and effectively into scientific reports, papers and oral presentations, following established chemistry norms
Summer Project Goals

• Creation of Digital Content (short videos of preparation of samples and instrumentation instructions)
• Install Virtual Desktops and our instruments’ software and Create instrument simulations

Students will manipulate virtual instrument panel to analyze dataset on virtual desktops.

Students will write technical and full lab reports

Instruments: AAS, Fluorimeter, UV-Vis, IR, NMR, CV, Potentiometry, HPLC, GC, GC-MS

• Develop Research Proposal Plans

Students will be able to choose from a scenario to work on, they will have to write and present a research proposal
Resources

- SUNY Health Alert: http://suny.edu/health-alert
- SUNY Remote Learning Resources: https://innovate.suny.edu/covid19/
- SUNY Academic Programs: https://system.suny.edu/academic-affairs/acaproplan/app/
- Middle States: https://www.msche.org/covid-19/
- USDE: https://www.ed.gov/coronavirus
- The Academic Programs Team (David Cantaffa, Lenora German, Ann Hawkins, Fred Hildebrand, Dan Knox, Deb Moeckel, Lisa Montiel, Phil Ortiz, Angela Pagano, Susan Panetta, Laura Trottier): program.review@suny.edu and/or https://system.suny.edu/academic-affairs/acaproplan/app/find-your-campus-reviewer/
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