

Virtual or Remote Laboratory Considerations & Strategies at UCLA (draft)

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A. Themes Emerging From Instructor's Burning Questions

Questions for Administration:

- Will lab fees be waived or prorated for spring?
<https://www.registrar.ucla.edu/Fees-Residence/Course-and-Study-List-Fees/Course-Materials-Fees>
- Virtual labs & simulations, computational lab software licences - how will costs be covered?
- Virtual labs & simulations are not on the [UCLA approved list](#); how should this be handled by lab instructors?

Questions for Discussion During [CEILS Zoom Sessions](#):

- Contingency plans for when lab instructors (or TAs) are ill and unable to teach?
- Integrating Zoom into labs w/ TA (and LA) support
 - Facilitating group work online
- Virtual lab options and plan for delivery to students
 - Lab activities requiring time outside of normally scheduled labs
 - Field trips
 - Integrating research projects
- Pros/cons to creating lab videos
- Making videos interactive: How to embed quizzes using CCLE
- Pre/post assessment, exam or practical administration

B. Recommended Strategies for Delivering Remote Labs

(1) **Think about the structure of the labs.** Some may be integrated as components of larger lecture courses (lab sections as is the case for Physics) or comprise the entirety of a course (lab courses as in Biology or Chemistry). Consider both scenarios when defining what the labs are meant to achieve before selecting an online alternative.

(2) **Think about the focus of the labs** (e.g., the learning objective) and select a combination of activities that supports and aligns with those objectives. Consider shifting the focus and modifying the learning objectives to what *can* be accomplished in a remote or virtual learning environment.

If the focus is on **learning techniques** or instrumentation and their application to specific experimental situations, consider asking students to engage in online simulations that cover at least portions of, if not the entirety, of a protocol. Some video resources have assessments built in. For others, you may have students watch videos of experiments, asking them first to make predictions and then discuss the results. In other words, try to incorporate online modules that allow for inquiry, not simply demonstration.

If the focus is on **interpreting experimental data**, consider extracting datasets from the published literature or open-source databases that are similar to what students would have generated conducting experiments in a lab or in the field and develop problem sets that focus on the interpretation of the data. One could also consider an approach that emphasizes inquiry-based critical thinking skills by combining the experimental protocols with interspersed questions that explore the reasons behind specific steps so that students gain deeper intuition into *why* certain procedures are performed. In place of actually performing the experiment, students can gain a critique-based understanding of the method followed by data interpretation.

If the focus is on **project-based lab research**, as is often the case in **course-based undergraduate research experiences (CUREs)**, your students are working on either individual or group projects from the start of the term. Furthermore, there is usually a capstone assignment in the form of a final paper, grant application and/or poster that describes their work, both with context and future directions defined. Consider asking your students to switch to the capstone assignment now with an emphasis on interpreting data collected by prior student cohorts conducting similar projects or focus on having them predict their experimental outcomes and design the experimental steps necessary to address a hypothesis. Divide up the rest of the term into draft submissions of sections of the capstone that will allow you to provide formative feedback and enable your students to experience experimental design, further hypothesis building, and predictive data analysis.

(3) Think about campus access. Do instructors/lab staff/TAs currently and will they continue through the entirety of spring quarter to have access to campus, including lab room, equipment, and supplies?

If the answer is YES:

For students working on a common research project, the instructor/TA/lab staff may carry out experiments and provide data to students for analysis.

For students doing independent research projects, have them write them up to share anonymously with the class and then vote for the top choice that the instructor/TA/lab staff carries out and shares data with the class to analyze and draw conclusions.

If you are thinking of video recording the experiment with someone narrating the protocol aloud as they go through the procedural steps, please consider accessibility issues:

- Bandwidth for live streaming could be problematic for students connecting remotely so recommend posting video content for asynchronous viewing only.
- Provide closed-captioning (e.g., transcripts with timestamps associated with video) for hearing impaired students.
- Be aware that vision impaired students may encounter screen reader compatibility issues.
- Please consult the UCLA Disabilities and Computing Program (DCP) resources page for additional guidance with video uploads: <https://dcp.ucla.edu/resources>.
- Additional best practices for accessible online learning can be viewed here:
- <https://drive.google.com/file/d/1-TOY3KW-dxz12y31Eo022U6riLYxUj-G/view>

If the answer is **NO**:

If instructors/lab staff/TAs cannot get to campus and are unable to access lab rooms, equipment, and supplies, then be prepared to finding an existing YouTube video or other video resources with similar techniques demonstrated for students and then give students datasets to analyze either from existing open-source repositories or from prior terms in which the class was offered.

(4) **Think about whether students will work individually or in groups.** Tending to group dynamics and carefully considering accountability structures are still critical to consider when planning for remote student engagement with one another. See *CEILS Teaching Guide* on Designing Effective [Group Work](#).

Set up weekly videoconference meetings via Zoom either by lab section or with each student group to discuss experiments, answer questions, and if appropriate, plan what experiments need to be completed to have data to analyze for their research project to progress.

REF: <https://bokcenter.harvard.edu/remote-labs>, SABER listserv

C. General Considerations in Creating an Inclusive Remote Lab Experience for your Students

1. Remember the big picture – the COVID-10 outbreak has created an unprecedented set of circumstances in which we are delivering an educational experience to our students. Acknowledge that the process feels overwhelming and stressful not only for instructors, but also for your TAs and most importantly, for your students. Continue to communicate and reassure your TAs and students that their health and well-being are critically important. Emphasize that you will try to be as accessible and supportive as possible, providing resources and tools that attend to and balance both their academic and social-emotional needs during the quarter.

Link to an article for some perspective:

<https://anygoodthing.com/2020/03/12/please-do-a-bad-job-of-putting-your-courses-online/>

2. Acknowledge and be realistic about the limitations of online/remote lab experiences; we simply cannot offer an authentic, hands-on experiential lab class remotely. And there are pros/cons and trade-offs to different approaches. Students may not experience a “real” lab class this quarter; however, we must commit to giving them a quality educational experience while limiting their chance of getting sick or passing the coronavirus on to friends and family members.

- The learning objectives can’t be met if focus is on techniques or learning lab skills.
- Need to revise the learning objectives and shift the focus of the lab to what can be accomplished in a remote or virtual learning environment.
- Acknowledge that we will do the best we can to provide valuable learning experiences but that this isn’t a “real” substitute for the in-person lab. That said, we also cannot cancel the lab class and delay timely degree progress for our students.

3. Realize that we cannot expect that students all can attend real time Zoom lectures or interactive online events/experiences. Furthermore, students may not have the same flexibility or ability to dedicate the time to lab activities that they would have ordinarily had if they were on campus.

- Students may be in different time zones.
- If connecting from off campus, students may not have access to computers or high-speed internet at the time of your class; they may be attending to sick family members or their own health concerns, which should be their priority. Non-traditional students may be taking care of their own children that are out of school.
- Try recording your Zoom lectures or other videos and post them on CCLE. Consult the UCLA Disabilities and Computing Program (DCP) resources page for additional guidance with video uploads and Zoom instruction: <https://dcp.ucla.edu/resources>.

4. Actions to take in preparation for your spring lab class:

Send out a poll to your class to solicit the following information, indicating that student responses will help you with course planning. [Google forms](#) is a great tool for these types of informal surveys. You may also use CCLE tools.

SAMPLE TEMPLATE

Dear students,

Our lab course is still on for spring! We'll be doing a remote lab and the experience will be different from a typical in-person lab experience. But it will be great and we'll learn a lot together!

To help me plan our lab course for next quarter, please complete this short survey by Friday, March 20, 2020. Your responses will inform what technology we use and the format in which we provide course materials to you.

So stay tuned, I'll continue to communicate with you during spring break to make sure we're all prepared to start class week 1. Please email me if you have questions or concerns that impact your participation in our class.

Sincerely yours,
Professor X

Survey Questions:

1. What time zone will you be in for spring quarter?
2. What limitations might you anticipate that may impact the time you have to dedicate to class or the timing in which you are available to attend lecture and/or lab at the scheduled times?
3. Do you have access to a computer and adequate internet facilities to support your participation in our class? If not, please briefly explain your anticipated challenges with access.

In response to this information, please consider the following ideas for your course:

- Revise your syllabus with realistic learning objectives. Talk about what changed and why with students on the first day of class.
- Plan lectures and other learning activities accordingly.

REF: Thanks to Peggy Fong and Jon Fong in EEB for these great suggestions!

D. Link to CEILS's Remote Teaching Resources for Labs

https://docs.google.com/spreadsheets/d/1_qFmJQhislBobK8paTi3setQ0K8fmK4bE2M8EhKSDE4/edit?usp=sharing