Laboratory Issues and Ideas

a collaborative document summarizing issues and ideas for conducting laboratory work in the COVID era

Click on the outline header on the left (open that if you can't see it) for your discipline.

From Brian Williams to Everyone: (10:37 AM)
 Here is a resource for those who might be wondering about how to integrate the online with in-person. https://www.youtube.com/watch?v=C7VScPdhMvY
(Michael Caulfield's (WSU/Vancouver) excellent starting point YouTube presentation on what he calls "hyflex")
BH: There is an extensive workshop course on this topic also by Michael:
https://emergencyonline.blog/category/blended-content-studio/

General

Issues:

- Uncertainty from admin
- General problem of students in lab and tuning in via some sort of remote connection (phone or zoom)

Solutions:

somewhat aside; more in-class related, but certainly with some possibilities for lab:

Art, Nursing, and Psychology

1. Issues: Concerns about having nursing students perform psychomotor skills online

Solutions:
- Meet students in person at first in a face to face environment, order all supplies at the beginning of the year, then have students take all of their supplies and medical equipment home with them when or if the curriculum transitions to.

2. Issues: 14 weeks has turned into 7 weeks or something similar in which the semester is shortened. Normally labs are once per week for psych lab

Solutions:
- Have lab twice a week
- Cut lab content in ½
- Have students choose 5 out of 10 lab assignment option

3. Issues: How do we move from a lab that was face to face and now do it online

Solutions:
- Use online resources that are available

4. Issues: Small spaces for labs which puts students too close together

Solutions:
- Move as much lab to online
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5. Issues: Small spaces for labs which puts students too close together

Solutions:
- Wear masks, PPE
- Outdoor classrooms and tents with portable white boards

6. Issues: With the condensed semester it impacts the time it takes to grade and return assignments to students

Solutions:

7. Issues: Normally would use actual dissection of the brain

Solutions:
   ● Use virtual simulations of dissection

8. Issues: Some assignment call for students to meet with the librarian

Solutions:
   ● Use Zoom

9. Issues: When students need to test out of performing a psychomotor skill and if we are online, how should that testing out be done

Solutions:
   ● Use Zoom to grade the document
   ● Use video taping, have students send one video of them performing the skill with their own feedback, Instructor provides feedback too, then the students resubmit a new video incorporating the feedback.
   ● The instructor performs the skill and has the students watch and documents each step the instructor does wrong or the students tells the instructor exactly how to perform each step of the skills
   ● Use the fishbowl method, one person is in classroom, 4 others are on line, each person has a role

Biology

Issues:

- Handling of shared equipment
- Equity
- Not being able to get within 6 ft of students
- Sharing information on one screen
- Getting to field sites
- How grad schools/professional programs will continue to consider/accept online labs

Solutions:

Dedicated scopes, lab materials that are only for one student

Using goggles with shared microscopes

App called "airscanner" remote wireless document creates a streaming video
https://apps.apple.com/us/app/air-scanner-wireless-remote-hd-document-camera/id431029631
(gives static IP address for video feed in browser)

CT data freely available for anatomy, diversity studies (e.g., morphosource.org)

AnswerPad - allows students to draw and/or write equations that can be shared with the instructor (also with the class)

Socrative

Poll Everywhere

Zoom Whiteboard - share screen, whiteboard
There's a [Zoom Room app](#) for iPad (also has an Andiod version): allows you to "run" the Zoom session, but you can share anything on your iPad (like an app that allows you to write/diagram - I use Notability)

Doceri - allows you to write on an iPad as if on a whiteboard and record/embed in PowerPoint or share in real time on your laptop.

Lab Buddies - Remote student watches via their "Live" student's cell phone (not really equitable, but better than nothing). Swap labs - remote student reads the instructions and instructs the live student. Or Prof or TA could demo for everyone. Might need bluetooth headphones

Wrap microscope eyepiece with saran wrap and discard between users.

Possible paid virtual lab systems: McGraw Hill, Labster, LabArchives (mainly data analysis)

Do you have the ability to put lecture content online and use face to face time to only do lab and discussion items? Maybe would work for upper level courses that are generally smaller in number.

Chemistry and Biochemistry

Issues:

How do we assess hands-on experiences?

Lack of skill building needed for later courses.

Is there a way to have a concentrated session on technique later in a student's career if not with this particular course?

ACS CPT & increased contact hours

Backup plan for fully online lab?

Student remote access to internet for hybrid lab experiences

Way to foster students learning from one another while distanced or virtual

How to have hybrid lab groups and have students hear in labs with hood noise & masks

How to learn from mistakes, doing it wrong, seeing impurities, etc.

Students do a set of labs in person then rotate to virtual -- equity in parts of the term corresponding to the lecture, due dates of lab reports

Solutions:

Grinnell: As much online as possible -- real data - pictures -- hoping for second semester more hands on.

Monmouth: Individual workers.

Beloit: 2 seven-week mods; two courses at a time. So far F2F in lab; online course;singles in the hood; lab partners remote.

LabArchives eNotebook.

Free NMR analysis software. Jeol? Bruker?
Microlab -- can be hooked up remotely. UV/VIS - for gen chem

How about videos of me making all sorts of mistakes doing an extraction: Your job is to identify all the mistakes.

How about "Laboratory fishbowl" - one in/four out.

Several are considering half in/half out plan.

Recording labs:
● GoPros? Ipad? Cell Phone videos? (Upload to private youtube)
● TA or faculty pairs to help with recording
● Might be useful for instrument operating directions/prelab

[NC State Virtual Reality Online Chemistry labs](#)

A couple (paid) virtual lab experiences:
● https://www.labster.com/
● https://praxilabs.com/en/3d-science-simulations
● http://pnxlabs.com/index.html
[could institutions pony up for this? How to ensure ALL students can access and use this based on cost and technology required?]

Anyone considering "at home" lab kits, homemade?

Students wear headphones in the lab, safety glasses, masks -- students out of lab on zoom -- can this avoid feedback issues in the lab? Costs associated with headphones? Will cell phone mics be able to pick up voice over hood and other ambient noise?

Physics

Issues:
- Safety for students and faculty in face to face lab
- Engagement and effectiveness for remote students
- Teaching students how to use particular software at a distance
- Getting students access to particular software
- How to do an experiment that requires more than one pair of hands to make the equipment work. Would need to sit next to each other closer than 6ft.
- How to troubleshoot when students have trouble?
- Small rooms: how good is the ventilation, what needs to be done in between students accessing the room.
- Integrating remote and in-person students
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Solutions:
- Give students remote access to on-campus computers to access on-campus software.
- Have students work in pairs/small groups with one person in the laboratory, and the rest participating in data collection, data analysis, and reading the lab directions.
- Use microphone in computer for sound analysis.
- Use video analysis software for motion study.
- Use videos to do other kinds of experiments: make observations, make predictions
- Use "canned" datasets online (e.g. Sloan Digital Sky Survey, which has [nice labs](#)), citizen science (e.g. Galaxy Zoo and [Zooniverse](#))
- What can they do at home: naked eye astronomy observations, pendulum timing with a stopwatch, make their own video and analyze it. Qualitative exploration of diffraction with slits and pinholes in aluminum foil, etc. (view distant streetlamp).
- Big room with multiple stations; students wear gloves and masks and rotate through.
- Use plastic bags over keyboards and mouses (Uline - very inexpensive).
- Use Arduinos in Electronics and Advanced Lab, which can be done at home
- Use sensors and apps on a smartphone to take measurements
- Simulations:
  - [PhET](#)
  - [Falstad](#)
- Great source of physics applet for simulations: https://www.falstad.com/mathphysics.html. I particularly like the waves, 1D QM, electronic circuit simulator applets. Free and accessible to all with internet.
- [BH disclaimer: I was involved in adapting Falstad and OSP applets for JavaScript along with Wolfgang Christian at Davidson College. Working with Doug Brown (Cabrillo

College) we are close to releasing a fully-JavaScript version of Doug's wildly popular Tracker program. The links below are to that work.] Another great resource is OpenSourcePhysics, which is a fully integrated interactive eBook-like context with over 1500 pages of introductory material and several hundred simulations. See particularly the section relating to Physlet Physics. Additional applets can be found at our SwingJS Examples site.