

Planning for Remote or Socially-Distanced Labs

There are three things to consider as you plan a remote or socially-distanced lab. First, scrutinize the learning objectives of the course. Once you have determined the primary learning objectives, then consider the types of experiments that enable assessment of these objectives. Finally, think about operations and logistics questions.

1. What do you really want your students to get from lab? Start with the written learning objectives for the course. Review Feisel and Rosa's article^[1] for other objectives that may be expected but unwritten.
2. What experiments can be run remotely or online so the students still achieve the learning objectives? There are many different solutions: virtual labs, remotely-operated labs, video links to labs, providing data supported by videos, and at-home experiments. Resources, web links, and pros and cons of these different solutions have been detailed by AIChE's Virtual Community of Practice (Labs).^[2]
3. How should labs be run to incorporate social distancing or with flexibility for sick students? Here are the issues that we've considered:
 - a. Do not let students share PPE without disinfecting between students. Require students to bring their own, revise the lab so lab coats are not needed, provide students space to store their PPE between labs, or disinfect between each use.
 - b. Must we provide masks for lab? Must those masks be used only in the lab? This depends on whether exposure to hazardous chemicals is likely. If lab coats are required and may not be worn outside the lab, then masks worn in the lab should not be worn outside the lab either, and you need to provide masks. If there are no chemicals that would remain on the mask after lab, then masks worn in the lab are fine outside the lab, and you don't need to provide them. Most of us keep some around in case students show up without them, although at some institutions they are available in vending machines and departmental offices.
 - c. Consider disinfecting keyboards, mice, and common surfaces such as balances, valves, countertops, etc. between students. One idea is to provide a "cleaning checklist" with each item that must be disinfected after lab and a signature spot for the responsible student to sign. Emphasize the required dwell time for the disinfectant, which may be 10 minutes. Have a lab assistant check that the sheet is completed after each lab.
 - d. Maintain social distancing during the busy start and end of lab by scheduling the teams to arrive at staggered times instead of all starting lab together.
 - e. What do I do when a student gets sick? Make sure sick students stay home! Labs may be run with one or two students in the lab and the rest participating remotely, with specific assignments of data recording, analysis, safety, and/or communications for the remote student. Have students "on call" to come into lab if the in-lab student becomes sick during lab.
 - f. Plan for the possibility of returning to remote education by scheduling hands-on or in-person activities early in the term. Can you have the students collect all of the data early in the term and analyze it later, possibly remotely? Can you make sure the students see all of the equipment at the beginning so they are more familiar with it if they are running that lab remotely or with videos? Also consider running the first week remotely as extra quarantine time for returning students.

The Villanova College of Engineering Remote Labs Workgroup has assembled a white paper that discusses these ideas in more detail.^[3]

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REFERENCES

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