

*This will help you with finding appropriate online alternatives, where required.*

## Online Lab Activities

During disruptions to on-campus teaching you may need to transition your face-to-face laboratories into online learning activities, for a period of time. When doing this it helps to start by identifying the purpose for the lab. This will help you with finding appropriate online alternatives, where required.

Many labs are a combination of different activities, so you can also combine activities when working online.

### Identify what students need to learn

- How to use specific equipment;
- Collect a variety of data;
- Interpret and evaluate the data;
- Understand why results are different under varying conditions;
- Complete project-based lab research.

### Activity examples

#### *Learning lab procedures.*

If learning lab techniques and their applications to specific experimental situations is the priority, an online simulation may help. Find out whether your unit's textbook provides any interactive lab-based resources or explore some of these existing simulations and virtual labs and assign these to students while they are learning online.

- [LabXchange](#) – a suite of lab simulations developed by Harvard University, with assessments that focus on basic molecular biology techniques;

- [MERLOT](#) - a collection of virtual labs developed by California State University and other institutions;
- [PHET](#) - interactive simulations for science and maths, developed by the University of Colorado.

Develop questions that relate to the experiment process, asking students to explore the reasons behind specific steps to understand why certain procedures are performed. Ask students to list the steps of an experiment in the correct order. This requires students to critically understand why each step has to come before the next in a protocol. Alternatively, you could ask students to complete a blank step to fill in once they identify what step is missing.

#### *Analysing data.*

In cases where the lab includes both collection of data and analysis, consider linking to a demonstration video that demonstrates how the data can be collected, and then provide some raw sets of data for students to analyse. This approach is not as comprehensive as having students collect their own data to analyse, but it will engage them with the critical parts of the lab experience while online.

For more advanced students, send them to find existing data sets that are aligned with the experiment they would have completed in the lab.

#### *Extending data interpretation.*

When students need to use the data to form conclusions, to develop lab reports, or complete written assessments, consider providing students with existing data sets (or have them retrieve the data themselves) then create problem sets that focus students on interpreting specific aspects.

Link to existing videos and ask students to watch the video of an experiment. Their active learning could be to **make predictions** before watching a video, and/or

**discuss the results** at the end of the video. The [Journal of Visualized Experiments](#) offers thousands of videos of experiments.

#### *Encourage online collaboration*

If the labs involve direct student collaboration, replicate the contact while online using live virtual tutorials, or set up activities that require students to engage in online conversations as part of the learning activity.

Students can collaborate asynchronously via live chats in [Microsoft Teams](#).

#### *Project-based lab research*

If the focus is on project-based lab research, your students may have already been working on their projects since the start of semester. Often, this is a capstone assignment, such as a final paper, grant application, or poster.

Consider asking your students to switch to the capstone assignment now with an emphasis on interpreting the data they have already gathered or, if they have not generated their own data yet, ask them to predict their experimental outcomes, and design the next experimental steps in detail.

Divide up the rest of the semester into draft submissions of sections of the capstone that will allow you to provide formative feedback and enable your students to experience experimental design, build a hypothesis, and predict data analysis. This approach aligns especially well with a written capstone styled like a grant application.

Live (synchronous) tutorials may also be included as part of the draft submission process, to support collaborative learning.

#### *Things to consider*

##### *Identify lab activities that can be prepared and delivered online*

Pre-lectures and demonstrations of techniques can be recorded and then uploaded. We recommend using [Panopto](#) to create your recordings.

*Identify what software your students will have access to*

When choosing software, remember to ensure all students will be able to access it. ECU provides [student access to a range of software](#).

*Keep time commitments and equipment requirements in mind.*

*Investigate virtual lab options*

Link to existing resources, not everything needs creating from scratch. Have a look at this [Excel spreadsheet](#), which collates a range of online resources that are freely available.