

Roadmap for:

Transforming Labs

The transition to teaching students the skills of experimental work and hands-on labs while respecting physical distancing **occurs in 2 steps:**



1.

Creating a list of the skills students need to practice and learn. This is best done by sequentially listing the skills experiment-by-experiment.

2.

Designing an alternative for each skill, so that students have the opportunity to develop the full range of skills over the different experiments that make up the semester.

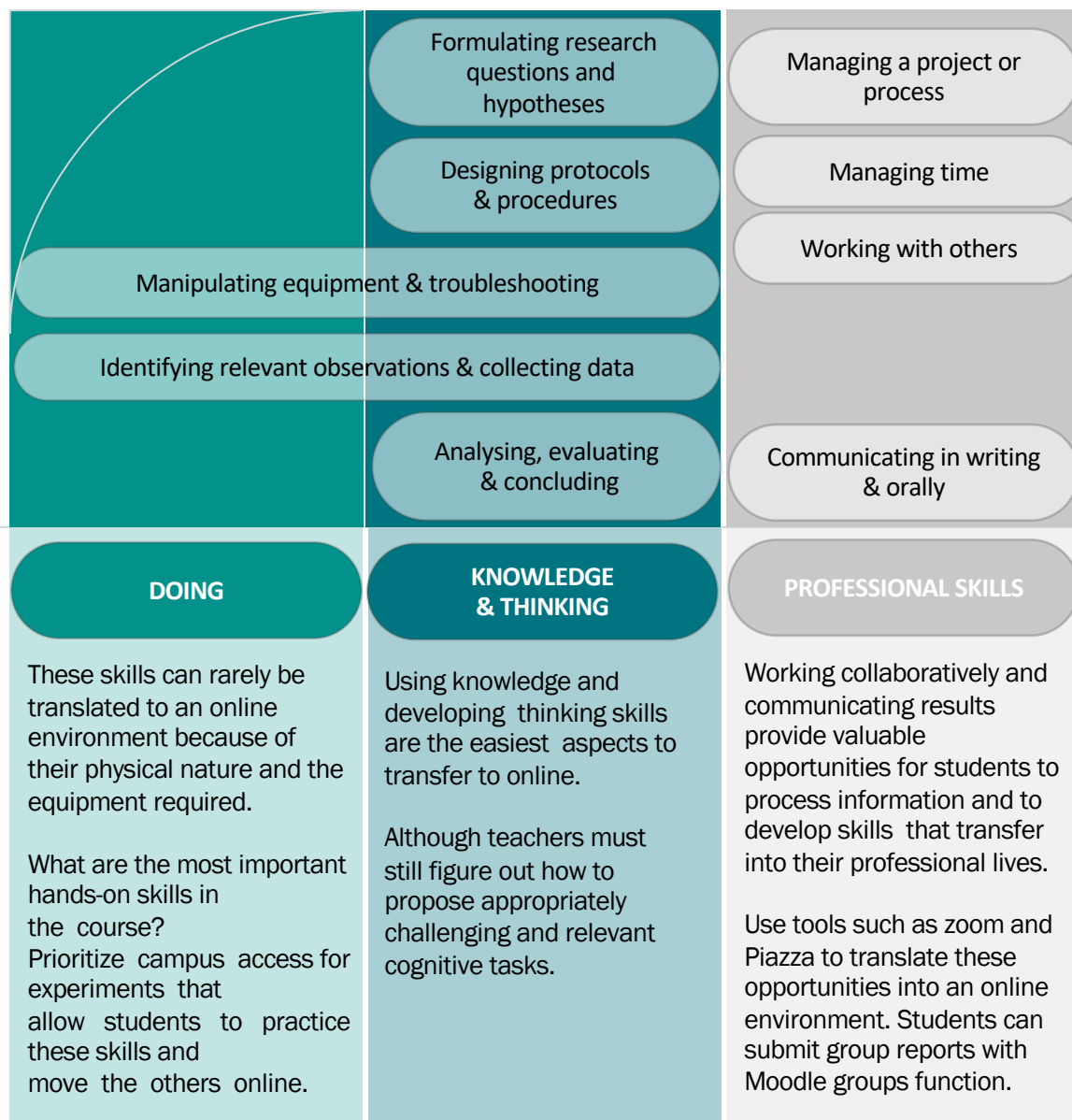
Replacing the rich, hands-on, in-person experience of a lab isn't obvious. But a varied mix of activities can allow students to engage in some of the thinking, communicating and teamwork aspects at a distance.

1. Creating the list of skills

Sorting the skills

more than just busy hands

"Doing" is central to labs. However experimental work also requires knowledge and thinking skills, as well as professional skills like project management and communication.



TIME

Plan for time

Use the ECTS listed on the course description to calculate how much time students should invest in your course (1 ECTS = 20-30 hours).



2. Designing online alternatives

Basic configuration

- ✓ **STEP 1** - Post the lab protocol on Moodle, with an assignment that tests comprehension such as a Moodle quiz
- STEP 2** - Demonstrate the protocol for students, either on a live Zoom session or as a pre-recorded video. This format will likely resemble a cooking show.
- ✓ **STEP 3** - Provide students with a data set that allows them to continue with the analysis and report writing steps.

How effective is this configuration?

✗ Doing
✓ Knowledge & thinking
✓ Professional skills

Advanced configuration

- ✓ **STEP 1** - From Moodle, link to a Piazza post of a question or issue and have students generate investigation strategies or hypothesis.
 - ✓ **STEP 2** - Working in teams, students propose or adapt a protocol in accordance with their response to part 1
 - ✓ **STEP 3** - In a live streamed session, perform the protocol developed in part 2. Students are responsible for troubleshooting, making the observations and identifying which data to collect.
 - ✓ **STEP 4** - Provide students with their data so that they can continue with the analysis and report writing steps
- ✗ Doing
✓✓✓ Knowledge & thinking
✓✓ Professional skills

Tips for online labs:

- construct a sequence of simulations & activities to address the full range of skills, as a single simulation is unlikely to do it all.
- ensure that each group has their "own" data set by generating multiple data sets or introducing some randomization.

Additional resources:

- [This EPFL guide](#) suggests specific tools for moving different lab activities on line.
- [This EPFL guide](#) illustrates how your students can use NOTO for coding and analysis activities. You can also create in-silico experiments and simulations.
- [This crowd-sourced list](#) of Online Resources for Science Laboratories spans disciplines from anatomy to electronics, with multiple detours.
- [This model course](#) provides examples of the various Moodle tools.
- This Moodle course template can be used to create a structure and communicate clear expectations to students
- [This EPFL use case](#) explains how Zoom break out rooms allowed students to work collaboratively and get assistance in an electronics labs.
- And [this guide](#) provides the *how to* details for break out rooms