The COVID-19 pandemic has been associated with university lockdowns, forcing physiology educators to pivot undergraduate laboratories into a remote delivery format. This study documents the experiences of physiology educators as they rapidly transitioned to remote laboratories in March-July, 2020.

### Participants

Ten physiology educators from the U.S., U.K., Canada and Australia.

They wrote reflective narratives that explored their experiences of the transition to remote laboratories. These anonymous reflections were thematically analyzed.

### DEVELOPMENT OF REMOTE LABORATORIES

Six educators converted all of their existing in-person laboratories for remote delivery, with another three cancelling only one or two labs (considered unsuitable for remote delivery).

Many respondents (60%) used commercially available online physiology laboratory resources for all or some of their remote laboratories.

Home-made videos were widely used to present preparatory material, explain equipment usage and/or demonstrate experiments.

A majority of respondents also reported using sample data, collected internally in preceding years or provided by a commercial partner, to allow students to practice the skill of data interpretation.

### METHODS

Participants: Ten physiology educators from the U.S., U.K., Canada and Australia.

### BACKGROUND

The COVID-19 pandemic has been associated with university lockdowns, forcing physiology educators to pivot undergraduate laboratories into a remote delivery format. This study documents the experiences of physiology educators as they rapidly transitioned to remote laboratories in March-July, 2020.

### OPPORTUNITIES

**New collaborations (local and international)**

The biggest opportunity has been the collaborations that have been established between physiologists teaching at universities both close by and in other countries.

**Staff development**

[lab technician(s)] rapidly retrained to provide expert support for teaching online.

**Exploration of unfamiliar technologies**

The student comments are graded via artificial intelligence, so the time requirement for teaching assistants was minimal.

**Revisiting the laboratory curriculum and structure**

The pandemic situation has made us question whether the way we performed this class in person was giving the students the best experience in gaining the practical skills they required.

### CHALLENGES

**Excessive workloads**

It has been challenging to modify so many labs in a relatively short period of time while at the same time having to teach.

**Lack of expertise**

I spent a lot of time on YouTube trying to learn how to do different things and work different types of software.

**Disparities in online & workspace**

A few students had to sit in the parking lot of a local library to access the internet.

**Changes in learning outcomes**

Out of my 7 TAs (teaching assistants), 3 struggled to balance teaching, research and overwhelming anxiety.

**Educator and student stress**

Even during Zoom office hours, many never turned on their camera or microphone.

**Academic integrity issues**

In the interest of personal sanity, I let go of lab quizzes and weekly assignments.

**Reduced student engagement**

One of the biggest losses in the online lab was students not being able to design and carry out some of their own experiments.

### RECOMMENDATIONS FOR REMOTE LABORATORIES

Despite the challenges, most of the educators planned on retaining successful aspects of the remote laboratories post-pandemic, particularly with a blended model of remote and in-person laboratories. This study concludes with recommendations for physiology educators as to how they can plan, develop, deliver and assess effective remote laboratories, developed from the main themes that emerged from the reflective narratives:

**Planning:**

- purposeful reconsider learning outcomes
- try hands-on activities at home

**Delivery:**

- consistent structure
- reduce content
- low educator: student ratios
- synchronous blended
- facilitate collaborations
- videos of data acquisition.

**Assessment:**

- reduce assessment
- use pre-lab assessment
- team-based assessments

**Training:**

- train educators for effective online delivery

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