Livestreaming Online Organic Chemistry Labs

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Background

The forced transition to online teaching as a result of the global pandemic moved the organic chemistry laboratory experience to the virtual world. With limited time and no known best practices, we had to experiment. Two ideas were put forward:

1. Film the experiment beforehand and have the teaching assistant watch the video with the students, pausing to describe the steps and to question their understanding.

2. Livestream the experiment and have the teaching assistant ask the students how to perform the experiment.

Both approaches are synchronous. We believe a social environment is a crucial factor that makes the teaching laboratory effective and enjoyable.

Approach (1) has the TA watch the video with the students over Zoom. The video has no audio in order to allow the teaching assistant to walk the students through the procedure, and to encourage the students to show up to lab. The absence of audio in the video allows the teaching assistant to offer their individual advice and experience with the techniques and methods.

Approach (2) has the TA interacting with the students online via Zoom while an assistant performs the experiment. This approach takes much longer, as we cannot speed up refluxes and recrystallizations, but opens up free time for the students and TA to socialize and further discuss the chemistry.

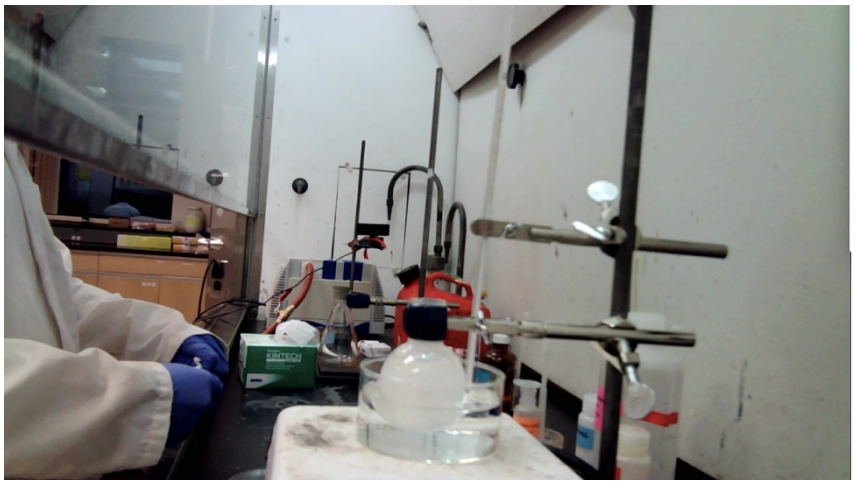

Figure 1. View from a fume hood webcam during a lab livestream.

The livestream setup consists of 4 different webcams: 2 set up in the fume hood (one on each side); a third set up in front of an analytical balance to show students starting material and product masses; and lastly a webcam for the TA to interact with the students. The TA switches between these vantage points when appropriate.

Student Feedback

One TA teaching two sections tried both approaches. Students were asked to complete a short survey about their perceptions of the approaches and their learning. The response rate for the lab video section was 10 out of 19 students (53%) and for the livestream section was 13 out of 20 students (65%). Student responses in the lab videos section varied, whereas responses from the livestreamed section were entirely favourable, with the anticipated exception of some neutral responses regarding tactile understandings of glassware and instruments.

1. Overall, I am satisfied with the way the online organic chemistry laboratory was delivered.

2. While watching [this approach], I was engaged in critical thinking and problem solving.

3. [This approach] made the lab interesting.

4. [This approach] made it easy to record appropriate observations during an experiment.

5. [This approach] helped me understand the purpose of specific glassware and lab instruments.

6. After watching [this method], I am confident that I could perform the laboratory experiment in person.

7. [This method] is an engaging method to teach labs online.