

# Ideas for Large Enrollment Lower-Level Biology (Science?) Courses Online

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## General ideas

Society for Teach and Learning in Higher Education (STLHE) - curated list of resources: [https://keepteaching.ca/Living\\_document](https://keepteaching.ca/Living_document) for STEM teaching from STLHE. [I believe this will be moved to keepteaching.ca]

Advice from an online expert: [Viji Sathy](#), including inclusivity, exams, and more

Most of the ideas below have been mentioned in multiple sources as valuable for online teaching, and at least speculatively suggested to work with larger enrollments. Sources: the cabal listed above, SoTL articles, blogs, recent webinars, my own experience with clickers which have some of the same issues as online exams.

## Groups

Group work is consistently mentioned, and can be achieved in various ways via LMS activities or break out rooms in synchronous apps (Zoom/Teams/Collaborate). All software seems to have a virtual whiteboard option to facilitate this (and if not, an easy option is to use [MS Whiteboard](#) or [Google Jamboard](#)). One key issue with using groups in any aspect of the course is [the evidence from SoTL](#) that groups really should be deliberately constructed with a mix of student abilities to ensure rough equality among groups. So, effective use of groups will need planning and effort to implement.

## Evaluation Weights

Evaluation weighting shifted from quizzes and exams to doing the in-course activities. Examples: up to 20% for a participation grade (better to design this as an “engagement” grade), and only 10% of the grade on the final exam. This, of course, makes it possible to pass the course without passing any of the exams – one solution was to switch up the system and deduct points from students that do not complete engagement activities. This, not surprisingly, is not popular with students but is quite effective. Any of these options require recalibrating difficulty levels and marks available in exams (and other graded items) compared to typical face-to-face exams.

## Socioeconomic Bias

Unfortunately, almost everything mentioned below has the potential to introduce inequities among students based on socioeconomic factors. The implicit assumption is that students will have consistent access to a computer or tablet with a camera in a quiet environment. If a student is missing any aspect of those basic requirements, it could affect their performance in the course relative to other students. In addition, exam proctoring costs are typically covered by students. Some institutions provide students with equipment loans to ensure they have the basic technology required.

## Sharing Experiences

One thing is guaranteed for the near future: students and instructors will not always be in the same space. This could be because of banned face-2-face interactions, or because of travel restrictions, or short-term illness. At the bare minimum, we need a system for instructors to share material with students that miss a lecture or a lab (whether it’s a whole term of lectures or labs, or just one, doesn’t matter). The key, then, are good recording systems: in classrooms, in labs, and in the field. So, we need classroom audio recording, and [stabilized wearable camera systems](#). These allow asynchronous delivery of anything we normally teach.

## Lectures

- student-instructor connection-building activities very important early in course
- short mini video lectures rather than longer video lectures
- flipped classroom approach (e.g. video lectures and reserve synchronous for active learning: group discussions, problem sets, exercises, worksheets)

## Exams

- strategies are needed that
  - generate the perception that cheating is easy to detect and there is a very low threshold for what we consider cheating; penalties for cheating are harsh; it's best to come across as very strict on this at the outset, but make sure rules you set afford flexibility for dealing with instances of cheating (which hopefully will be very few); a good option seems to be to implement several of the strategies below and run a practice exam early in the course to familiarize students with the online exam system, troubleshoot technical problems, and (frankly) scare students with all of the anti-cheating measures
  - make cheating more work than not cheating
  - diminish the probability that generic biological information (and answer banks) can be used to answer questions
  - deter the use of the internet or other devices during the exam
  - verify the identity of the exam-taker
- course-specific questions (rather than curriculum or discipline-specific questions) – essentially partition some of the grade simply to evaluating whether or not they have attended/learned from this specific course
- personalized questions so that generic answers won't work (see examples below)
- randomized answer orders in multiple choice
- random selection of questions from question groups
- short times for completion of questions (and the whole exam)
- identity verification questions (e.g. have students submit their favourite colour etc. early in the course, and then ask them their favourite colour in the exam -with a very short time to provide the answer; students are warned that two incorrect identity verification answers are considered evidence of cheating)
- include questions that require a video response; in Moodle this can be accomplished with the PoodLLs plugin; combined with identity verification questions this could be very effective
- provide questions in an image rather than text to confound copy/paste of question into Google; ensure image file names do not identify their content ; [easy way to do both of these is prep questions and images in PowerPoint and then export slides as images]
- [Respondus lockdown browser](#)
- [Proctorio](#), [ProctorU](#), etc. (NOTE: those with most experience doing online examinations are using these, along with Respondus)

## Labs

- Skills bootcamp upon return to face-2-face
- Beth Davis-Berg has prepped a bunch of online zoological labs, which she is willing to share.
- Exploit online sources of biological data (nest cams, Cornell bird feeders, camera traps, NEON (<https://data.neonscience.org>) as well as concurrent environmental data as the basis to teach data analysis and presentation skills (graphs, etc.)
- Exploit citizen science initiatives  
<https://www.zooniverse.org/>  
<https://scistarter.org/>
- Step-by-step labs can be recreated in LMS using progressive modules and images or video taken from face-2-face version of the lab (all LMS will have an activity that allows this). If delivered synchronously, interaction and progress monitoring can happen via Teams/Zoom/Collaborate. If delivered asynchronously, then questions in the LMS (mini-quizzes, feedback, etc.) can be used to monitor progress.
- [SimBio](#) has a really good reputation amongst those that have used it
- [Good wearable cameras](#) may be the key to giving students a first-person experience of some lab stuff.

## Personalized Question Examples

- You are taking a young cousin to the aquarium and they love sharks and fish. Write them a note to explain the differences between bony fish and sharks. Be sure to explain skeletal, scale, buoyancy, respiration and reproduction differences.  
[If they don't write a note to a young cousin using language that a kid can understand they lose points.]
- Why are the reptiles considered to be a Paraphyletic group rather than a monophyletic group? Explain these terms and how the content of this taxon have been revised to make this group monophyletic. Do you like this solution? Explain why or why not.  
[They need to say if they like the solution. Usually this keeps them from looking everything up since it's more personal.]
- Mr. Tripsy is very drunk when he is brought to the emergency room after falling down the steps. He is constantly complaining about his "cotton mouth". Knowing that alcohol inhibits ADHs action, you explain to him why his mouth is so dry. What do you tell him and how will you answer his questions?  
[They need an answer that makes sense to someone who's drunk. Excellent answers are very fun to read.]