Teaching Animal Behavior in the Midst of a Pandemic: A Primer

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16 Abstract

17 Face-to-face classes in animal behavior often stress experiential learning through
18 laboratories that involve observation of live animals, as well as a lecture component that
19 emphasizes formative assessment, discussion and critical thinking. As a result,
20 behavior courses face unique challenges when moving to an online environment, as
21 has been made necessary at many institutions due to the COVID-19 pandemic.
22 Although online behavior courses may be remote, they can still be interactive and
23 social, and designed with inclusive pedagogy. Here we discuss some of the key
24 decisions that instructors should consider, provide recommendations, and point out new
25 opportunities for student learning that stem directly from the move to online instruction.
26 Specific topics include challenges related to generating an inclusive and engaging
27 online learning environment, synchronous versus asynchronous formats, assignments
28 that enhance student learning, testing format and execution, grade schemes, design of
29 laboratory experiences including opportunities for Community Science, design of
30 synthetic student projects, and workload balance for students and instructors.

Introduction

When we started teaching in early 2020, none of us expected our courses would be online within a few months. As instructors of animal behavior, we saw the challenges of moving our courses online -- courses that typically involve discussion, active student engagement, hands-on laboratories with live animals, and other components that can be particularly challenging to replicate in the online environment. Now, we are faced with online instruction for an indefinite period of time. Our goal here is to summarize some of the best practices for pivoting to teaching courses in animal behavior using an online format, based both on the literature and on our collective experiences (see About the Authors, below). Our intention is for this paper to serve as a useful primer and reference guide when instructors are redesigning their behavior courses for remote teaching.

Transitioning to remote teaching can be intimidating, regardless of whether you are preparing to teach online only, or combining face-to-face with online teaching. Our approach here is to identify key questions you should consider early in course planning. We also identify priorities, challenges, and opportunities that may arise as a consequence of your rapid transition to remote teaching. We stress that transitioning to pandemic-driven virtual teaching is different from the intentional online course design that has traditionally been used in remote learning (Hodges et al. 2020). Even if you are currently planning to teach face-to-face during the 2020-21 academic year, the discussion below may be important to consider given that the on-going COVID-19 pandemic may necessitate a return to emergency remote teaching.

Teaching in this time requires flexibility; we know that our (student and faculty) personal and institutional situations can change at any moment. The practice of flexibility and resilient course design that we engage in now will prepare us to be better teachers in seemingly more secure times. Even absent a pandemic, both students and faculty can be faced with health, access, family, and financial challenges mid-course. The work we put in now for building thoughtful alternative assignments and assessments, as well as new ways to access content, can form a robust strategy for inclusive education and faculty preparedness during unpredictable circumstances in the future. These have always been excellent practices for both faculty and students with disabilities and chronic illnesses. A more resilient design can also enable quality instruction when faculty must be away mid-course for conferences, talks, and seasonal field work.

Thus, while the prospect of designing an online course can seem daunting, there are opportunities that can be embraced during this transition! As you rethink the pedagogy of your behavior course, we hope you'll find that much of what you develop for an online course can be re-purposed or re-imagined for face-to-face classes, leading to lasting modifications that improve content and increase accessibility for students. Reframing this change as an opportunity to refresh yourself on the latest developments in science pedagogy can improve not only your online course, and not only your behavior class, but all of your future face-to-face classes as well. These opportunities for pedagogical exploration will be a recurring theme throughout.

Some opportunities that may be of particular applicability to teaching behavior online include:

- *Sharing of knowledge and resources*. We don't have to reinvent the wheel; we can collaborate and learn from our peers across institutions. There are several collaborative resources already in place for animal behavior instructors to share content, ideas and questions (see Recommendations for Faculty, below). If you choose to use a shared resource, please give credit, and notify the creator of the content so they can build the outreach and teaching portion of their CV for their own professional development.
- *Extending collaborations in teaching and research*. This crisis could also be an opportunity for developing innovative, highly distributed Course-based Undergraduate Research Experiences (CUREs). Imagine students collaborating with peers nationally or internationally, all collecting data on the same variables on the same project, and meeting with "labmates" from multiple institutions to discuss the challenges and findings (for example, see squirrel-net.org). Using this approach, it is possible to collect large amounts of behavioral data while giving students authentic research and collaborative experiences, including collaborations with a diversity of peers and mentors.
- *Incorporate global guest speakers.* The Animal Behavior Society 2020 virtual conference featured pre-recorded talks, presenting an easy opportunity for us to share our work and incorporate current research from a variety of specialties into our classes. An online environment also facilitates seamless integration of synchronous discussion or lectures with guest speakers from any location. We especially encourage you to invite a diversity of speakers that represent

scientists from different racial and cultural backgrounds, people with disabilities, and other scientists whose work has historically been excluded from the textbooks. Representation matters; science is for everyone and giving students the opportunity to identify with people who look like them is one way to increase inclusivity of your course.

- *Behavior courses are engaging for students.* Students often struggle with motivation in online courses; we are fortunate, then, that our students are often quite motivated to learn about animal behavior. Most students in animal behavior courses have already asked the question “why does that animal do that?” In a traditional course, we are able to capture and build on that natural curiosity for even the least engaged students. For online courses, this immediacy and personal relevance of the subject matter can help mitigate the disconnection students can feel in online courses. Animal behavior is also a media rich subject, and the audio and video components we use in our face-to-face classes integrate seamlessly in an online format. By encouraging inquiry about animals that students can observe from home, whether it be pets, backyard wildlife, nature documentaries, or social media , we can build additional inquiry based on classic Tinbergian levels of analysis.
- *Behavior courses are particularly amenable to online formats.* Our courses are generally concept-driven, and many of our assignments can be readily transitioned to online. The primary literature in behavior can be less technologically-dense and/or jargon-infused than other areas of biology, making it easier for students to take their first deep dive into hypotheses, predictions,

data, and interpretation. Constructing assignments about literature for an online environment present great opportunities for student learning and for engagement in discussion. Teaching data compilation and statistical analysis techniques is also possible online, including using existing tutorials such as those found on YouTube. Finally, behavior labs are often less constrained by technology than other biology disciplines: data can be collected with just paper and pencil.

We begin with some general recommendations for instructors embarking on transitioning their animal behavior class to an online format, and discuss how to prioritize inclusivity, equitability, flexibility and accessibility. We then explore the differences between the modes of instruction you may have as options for your course, some considerations for course design in an online environment, and recommendations that apply across all of your course components. Next, we focus on recommendations for specific course components: lectures, discussions, assignments, testing and assessment, laboratories, and office hours. Finally, we provide an overview of some software and resources you may find useful, and of concerns regarding intellectual property rights. The “best of all possible animal behavior courses” will differ between contexts, depending on students, institutions, and instructor goals, so our recommendations are often questions for consideration. We are not here to tell you how to teach your course, but as “guides on the side” as we all navigate this shift to online instruction together.

Recommendations for Instructors

We hope the information presented here provides a good foundation for instructors moving their animal behavior courses online. But a foundation is just the start; our first (and perhaps most important) piece of advice is to seek support in many forms. Instructors who have strong support networks are often more successful (e.g., Dohaney et al. 2020). Ask colleagues – especially those with online teaching experience – to provide feedback on your course structure, lectures, and assignments. Add them as a student (or similar role) to your online course, so they can provide more global feedback (and consider reciprocal altruism for this potentially labor-intensive task). Seek mentorship by senior faculty in your department (some institutions may provide compensation for this). Consult with education technologists at your institution, if available, for help comparing and learning new software options, or tracking down required hardware. And don't forget your students - providing them with opportunities for anonymous feedback throughout your course will supply you with critical information about how things are going, and what you might want to change. Support specifically for behavior courses is also readily available through several online platforms:

- **Facebook Group:** Behaviour and Evolution Teaching Exchange that currently hosts > 200 instructors across multiple continents;
- **Slack Workspace:** Behave Evol Teaching (behavevolteaching.slack.com) with > 40 instructors;
- **Google Docs:** Share behavior course syllabi, tests, exams, labs, assignments, and videos (https://tinyurl.com/behavteach); and where instructors, senior PhD,

and PostDocs can sign up to give shareable short lectures on a variety of behavior topics (https://tinyurl.com/behav-lecture).

Instructors in these informal networks exchange ideas and tips, and help bolster each other when challenges arise. It was the benefits of such an exchange that led to us writing this publication.

Teaching any new class can be all-consuming, but teaching an online class carries a particular risk to faculty workloads because class is always in session. You are constantly aware that at any time, you might log into your LMS to find student questions, interesting discussions, work to be graded, etc. Teaching is fun! And in an online class with engaged students, teaching is almost always an option. Assuming you have other responsibilities, then, you may find it valuable to provide yourself with boundaries with regard to time spent in (or out) of your course. If there are going to be regular windows of time when you are not available, be sure your students are aware of that.

Prioritize Inclusivity, Equitability, Flexibility, and Accessibility

Inclusivity and equity are not checklists of features to be added to a nearly-completed course. Inclusivity and equity are a mindset that weaves throughout your entire course, beginning with course design. A core theme in inclusive pedagogy is empowerment of students in their learning process (e.g., Freire 1970, Shrewsbury 1997); a course cannot be truly student-centered if students are not empowered (being centered without power is also known as being surrounded). We address specific topics related to inclusivity and equity throughout this primer, and also refer readers to Harris et al. (2020) for

additional recommendations for including inclusive teaching practices in your newly designed online courses.

During the pandemic we've often heard the adage "We're all in this together," although a more fitting phrase is "We all in the same storm, but not in the same boat" (paraphrased from Damian Barr, 2020). The impacts on students are neither equal nor equitable, based on multiple factors surrounding race, socioeconomic disparities, age, traditional/non-traditional student status, and whether they are first-generation college students. While taking classes, students may be working to support their family, have a disruptive home life, not have access to a quiet workspace, have chaotic work schedules, be caring for sick or young/elderly family members, be living with immunocompromised individuals or fall sick themselves, may not be receiving sufficient financial and/or emotional support, and may not have even their basic needs met. Access to reliable internet and technology can also impact when and how students can engage with the course. Some students may only have regular access to a phone rather than to a computer, may need to drive to another location for internet access, or may have to share a computer with others for all their course access. Additionally, students could be spread across multiple time zones. All of these factors may limit student ability to participate in synchronous sessions. To maximize inclusivity and equity, we encourage instructors to have asynchronous options for all course components (see "Modes of Instruction" below). Consider also anonymously surveying students regarding their ability to access different course components to ensure you are designing a course accessible to all.

We are not only preparing to teach during a pandemic, but also a recession and a social movement for racial justice. It is important to recognize that distractions are plentiful and multi-faceted, and social impacts on student learning are more pressing now than ever. Grace, compassion, and flexibility are key. Allowing for flexibility in due dates, providing alternative assessment options, and promptly responding to emails will help to enhance learning and ensure that all students feel a sense of belonging in your classroom as they juggle these challenges with course demands.

A sense of belonging disproportionately affects retention of first-generation students and underrepresented minorities (Murphy et al. 2020). We therefore also strongly recommend you work to cultivate a sense of community as part of your course. Emphasizing students' roles as scientists in that community should be prioritized above maximizing content. The Animal Behavior Society is actively working to promote Black scientists and increase inclusivity in higher education; we encourage you to do the same in your course. This can take the form of diversifying your syllabus and highlighting work by diverse scientists, including diversity statements on syllabi, stating your preferred pronouns in all communication, using diverse names and situations in the development of course assignments, and incorporating social justice into your course content (e.g., discussing how genetics has been used to further racist agendas, and how mate choice studies of humans have omitted LGBTQIA2+ people until recently). Note that we say "diversify" rather than the commonly used term "decolonization"; decolonization refers to repatriation, and shouldn't be used cavalierly (Tuck and Yang 2012).We won't be able to truly 'decolonize' our classrooms, but we can take important steps to diversify and decenter them from a Western lens (Appleton 2019).

Modes of Instruction

A fundamental question that each instructor must answer early in the planning process (if not decided by the institution) is how to deliver the course. As the definition of terms can vary, we here use the following:

- Hybrid course: some instruction occurs face-to-face and some is online;
- Synchronous course: a fully online course in which the instructor and students are online simultaneously, often sharing live video feeds;
- Asynchronous course: a fully online course in which instructor and students are not online at the same time – lectures are pre-recorded and discussions occur via discussion boards or similar format.

We will also use the abbreviation “LMS” for Learning Management System (for example, Blackboard, Canvas, d2l, etc.).

An online course does not need to be fully within one of the above categories, of course; these approaches can be combined. For example, a course with many asynchronous elements can also be supplemented with synchronous sessions. Here we briefly outline some considerations as you decide how to deliver your course. We’ll revisit these different delivery methods with regard to different course components in more detail.

- *These are not the face-to-face classes you’re looking for*. A popular hybrid model is to provide recorded lectures and other online content, and then use face-to-

face time for focused discussions or activities. If hybrid courses are an option at your institution, you might assume that this delivery will be the best option as it preserves some face-to-face interactions. Nevertheless, the kinds of interactions possible in classrooms may be different from what we are used to given physical distancing, masks, inability to share physical resources, etc. Furthermore, as pandemic conditions change, even classes that begin the term in hybrid format may need to offer a remote format for students who become sick, or be forced to move entirely online. Be cognizant of how public health guidelines are being implemented at your institution as you consider the face-to-face option, and be strategic in using face-to-face time for activities that engage students and promote active learning.

- *Synchronous seems better - is it?* Synchronous online instruction feels more familiar to students and faculty who are new to remote teaching, because it more closely resembles a traditional classroom. Perhaps as a result, synchronous teaching is often perceived by students and parents as superior to asynchronous teaching. Synchronous teaching has strengths in facilitating social connections and providing opportunities for immediate feedback. On the other hand, synchronous classes can have higher technological and internet access requirements, can be harder to access in real time for students with disabilities and students in different time zones, and can be more challenging for students with complicated work and/or family responsibilities (situations that are likely to be exacerbated during the pandemic). Recording synchronous sessions is only a partial solution to these equity concerns, as it creates a tiered system in which

students who need to rely on these have reduced access to discussion and interaction they provide.

- *Asynchronous also has pros and cons:* Course components that are primarily unidirectional (traditional lectures, written assignments) translate easily into an asynchronous format. Pre-recorded lectures generally have higher audio and video quality than synchronous lectures delivered via live streaming, and while students cannot ask questions “in real time” as they can in a synchronous lecture, they can pause and/or rewind mid-lecture as needed. With asynchronous instruction, students can have flexibility to work around their schedules. As discussed below, discussion boards and other media provide opportunities for asynchronous interaction among students and with instructors, although these are obviously quite different from real-time conversations. The loss of real-time social connections in a fully asynchronous class can also lead to feelings of disconnection and loss of engagement among students (Kebble 2017).

There is, in other words, no ideal mode of delivery, and each of us needs to evaluate the costs and benefits of each mode within the context of our classes, our students, and our institution. If you decide that your course needs to be fully asynchronous, consider prioritizing approaches and assignments that can foster engagement and interaction. If you decide that your course needs to be fully synchronous, consider not just recording your synchronous sessions but providing alternative options that will allow students to engage in the course if they cannot participate simultaneously. Strategically using a combination of synchronous and asynchronous approaches may allow you maximize the benefits while minimizing the costs of both.

Course Design

Designing any new course can be a challenge, but your first foray into an online format can be particularly daunting. Some, when moving a course online, may feel overwhelmed by all of the potential tools and techniques. For others, these same features can be a siren song, leading them headlong into waters they – or their students – may not be entirely prepared to navigate. How do you take advantage of these online tools without making courses overly complicated, and, even more critically, without losing sight of your learning objectives for the class? You want your courses to be engaging and effective, with your students mastering the same concepts and skills as in your face-to-face classes. You need to meet these goals without overwhelming either yourself or your students (who may be as new to this format as most of us are), while fostering a community that is inclusive and welcoming. How can you do all this with tools you're still learning to operate?

Backwards Design

The good news is that the principles of good teaching are independent of format: do not confuse the medium with the message. To adapt a face-to-face course to an online or hybrid format, consider employing backwards design. Whereas “typical” course design often begins with content – for example, “what textbook chapters do I want to cover?” – backwards design (Wiggens & McTighe 2005) starts with the desired outcomes: what do you want your students to learn? Think of this in terms of content knowledge, obviously, but also in terms of the skills and metacognition you want to foster. Next, consider how you would like students to be able to demonstrate their learning of each of these, and what activities or assignments might foster that learning. The last step, then, is to determine what content is necessary for the students to complete those activities or assignments.

While we all want our students to learn core behavioral concepts, it’s likely that our animal behavior courses differ in specific desired learning outcomes. Consider how your course fits into your overall curriculum. What are the prerequisites? What background are students likely to bring to the class, and what knowledge or skills might they need for subsequent classes? Our courses also likely differ in the specific content. Do you want your students to be well-versed in current “hot topics” in behavior? Do you want them to understand the history of the field, and how understanding has evolved? What exactly do you want them to understand about topics such as foraging behavior, sexual selection, or social behavior? How important are underlying mechanisms versus development versus evolutionary history versus functional questions? How important is the development of skills in modeling? Data analysis? Statistics? Reading and

interpreting primary literature? No doubt all of this is important, but no one course can do it all. Reviewing your learning objectives is a practice in prioritization: based on your expertise and experience, what is most important for your students in your class?

Just as reverse outlining can be an excellent editing tool, backwards design is effective for both new and established classes. When transitioning to online, backwards design helps you focus on what assignments are critical (that serve high priority learning outcomes), and therefore what activities and content need to be preserved. You may also realize that you have activities or content that are not related to your high priority learning objectives. Take this opportunity to simplify. In other words, rather than trying to pour your entire face-to-face behavior class into an online format, start by reviewing and prioritizing your learning outcomes, and allow them to drive your course design. As you learn new online tools and techniques, evaluate with the same metric: is this necessary to serve your primary learning objectives? Backwards design can help you avoid the siren's call of all the online tools and assignments you may be hearing about; do not let tools or activities drive your course design. Indeed, you may wish to retain this simplicity when you are able to return to face-to-face teaching.

Modular Structure

An online course needs to have a more regular structure than a face-to-face course. If your courses are normally like a novel – chapters of various lengths that flow together – think of the transition to online as a process of serializing it. Here again, your prioritized learning outcomes are an excellent start. Can content-related learning outcomes be grouped into related sets ("modules")? These modules might be textbook chapters or sets of chapters, or simply groups of interrelated concepts.

Whatever you use as the conceptual basis of the modules, ensure that each has clearly stated learning objectives, with connected activities, assessment, and related content. It's best if the schedule for the activities and assessment within each module follows a weekly routine (see Course-wide Recommendations, below). This means that modules will begin and end on a regular schedule, so consider your academic calendar as part of the design process. How will your module schedule be affected by holidays and breaks? Is each module completed in one week or will some span multiple weeks? On what day do new modules begin? And what about your skills-related learning outcomes – are they distributed across the term (i.e., semester, quarter, or block)? For larger assignments due later in the term, is there adequate scaffolding built into the assignment across weeks? When you set up your online course (most likely in your LMS), be sure each module has the same internal format, with the same pathway for progressing through it.

Grade Scheme

We'll address specific strategies for testing and assessment in more detail below, but in the design phase, it's worth considering what overall grade scheme you'll use in the class. Most courses use points-based or percentage-based grade calculations, but the online environment is particularly well-suited to alternative grade schemes, such as specifications grading (Nilson 2014).

Specifications-based grading schemes come in many forms (e.g., mastery-based, labor-based, grading contracts), and are well-established in composition and mathematics pedagogy (e.g., Inoue 2019). All share a set of common features: assignments and activities are accompanied by a set of clear, well-defined

specifications; evaluation of whether student work meets each specification is binary (no partial credit); and a system of thresholds for translating the degree to which the student completes work meeting specifications, sometimes in combination with percentage scores from traditional quizzes or exams, to final letter grades. In specifications grading, then, final grades are a direct reflection of student mastery of course learning outcomes (at least to the extent that assignments and assessments reflect these).

Specifications grading can foster a growth mindset in learning by providing opportunities for students to be re-assessed: resubmit assignments that didn't meet specifications, or take a new version of a quiz on which they failed to reach their desired grade threshold. Some schemes allow for unlimited "redos"; others include a system of grade "tokens" that can be exchanged for such opportunities: students start each term with a set number of tokens, often with chances to earn more throughout the term. In either case, students are given agency, in that they can see precisely what they need to do to receive their target grade, and are rewarded for revisiting and mastering the material they've struggled with.

The online environment is particularly well-suited to allowing assignment and/or quiz "second chances", as there is inherently greater flexibility in scheduling in this medium. In addition, many of the low-stakes assignments and action-based lab activities (e.g.. "collect an hour of focal animal observations" or "create an ethogram of an animal's behavior") designed for online courses make more sense to grade as meeting or not meeting specifications than by a points or percentage system. With clear specifications designed in advance, such assignments can be quickly incorporated into

the grading scheme and graded without the angst (for student or faculty) that's often associated with partial credit.

Course-wide Recommendations

While we address specific course components in later sections, there are some considerations that span all aspects of our courses.

Be Consistent, Informative, and Transparent

We encourage you to communicate with the students prior to the first class to introduce yourself and describe the course format. If possible, provide early access to the course LMS. Although ameliorating the global challenges of COVID-19 and institutional racism are not within reach for instructors per se, we can ensure that we don't compound student stress. The best way to serve students, especially in a virtual format, is to provide clear information about what students should expect from the course and from you, and what you expect from them. Be consistent in those expectations throughout the course. Consider also:

- *Canalized course structure*: An online course needs to be much more structured than a face-to-face course, as students will engage with some of the material without guidance, and it's easy for them to become frustrated. You don't want a mistaken click to take a student to the wrong reading or start the wrong quiz. And the more asynchronous the course, the more canalized the structure within the LMS should be. We recommend strategic use of LMS restrictions / access

gateways / release conditions for quizzes, assignments, discussion boards, etc, so students don't start down a path that they aren't prepared for.

- *Consistent and transparent LMS:* Create a routine weekly schedule to help students remember what happens when, and stick to that schedule (e.g., "I need to complete the readings every Tuesday, post my responses to the discussion board every Tuesday night, and take a quiz every Wednesday before the zoom meetings"). Provide transparency on the LMS that incorporates a clear and uncluttered online structure with regular labels. Ensure the structure within each module is consistent and clear. Where possible, integrate due dates and course events with the LMS calendar or to-do list features. Make use of the LMS gradebook and keep it organized and with the proper "weight" of assignments according to your syllabus. At the start of the course, create a high-profile "start here" area, with an "overview video" where you walk your students through your LMS site to show them where to find the syllabus, modules, schedule, descriptions of assignments, and gradebook, as well as where and how they submit assignments and take tests. Consider also recording subsequent, weekly videos that provide an overview of the topic and work for each week that is posted alongside the written instructions.
- *A good start is critical*: In the syllabus, introductory video, virtual meeting, and early discussion threads, we encourage instructors to explicitly discuss:
    1. How you intend to engage students each week;
    2. How often you expect students to log in to the LMS and how they should keep current with course news/announcements;

3. How many hours per week you expect students to work on the course
4. Course structure (what are the modules, what's inside each module, etc?). Visuals can be very useful here. Consider making a chart with weeks as the columns, and rows for different types of assessments, activities and content, so students can track their progress at a glance;
5. What your minimum technology requirements are, and the support available for students who encounter technological difficulties;
6. Whether students will be able to review videos multiple times; whether transcripts and closed captioning will be available for all videos and discussions;
7. What your policies are regarding: penalties for late work, missed synchronous events, tests or exams, flexibility when illness or other issues that students face arise, whether makeup work is possible, and other classroom policies;
8. How best to interact with you (e.g., email, text, office/student hours, professionalism requirements), and what student expectations should be regarding your responsiveness during working hours versus evenings or weekends;
9. Proper "netiquette" for discussion boards and chats, and how students should ask questions during synchronous events (interrupt you, post in chat, raise a hand).
10. What you consider to be appropriate "group work" versus what you expect students to do on their own.

Given this is more detailed information than students often experience in face-to-face courses, we suggest starting with a Syllabus Quiz, so that students read the syllabus, identify Wi-Fi/browser issues, and familiarize themselves with the LMS tools to be used throughout the class (e.g., a quiz portal). If you have a synchronous component, students could work together in small teams to answer the quiz questions. Team testing has the added benefits of peer-to-peer learning, helps them build team skills, teaches them about breakout rooms, and provides opportunity for engagement.

Provide Opportunities for Social Interactions

Humans, like most primates, usually spend their lives in social groups. When forced into social isolation, abnormal behavioral patterns can develop and persist. In non-human primates such as marmosets, social deprivation during the transition from adolescence to adulthood results in disruption of hippocampal neurogenesis, increased cortisol levels, and elevated anxiety-related behaviors (Cinini et al. 2014; Gould et al. 1998). Similar effects may occur in humans as they experience elevated social isolation due to the pandemic. Stress levels may be further exacerbated by the global recession and social movements for racial justice. Because of these stressors, we emphasize incorporating numerous opportunities for social engagement into your course.

Social interactions can lead to increased student success directly (e.g., impromptu peer study groups allow for learning by teaching) and indirectly (enhanced psychological motivation to study, reduced mental health issues). Social interactions can also help students develop a sense of belonging, one of the biggest factors in whether or not students persist in STEM degrees (Good et al. 2012; Nostrand and Pollenz 2017; O'Brien et al. 2020). Social interactions are therefore important, and not

merely fluff. Thus, give yourself permission to reduce course content in order to increase opportunities to develop students' roles as scientists within your classroom community. We provide some recommendations for fostering social engagement below.

- *Groups are social*. Working in groups can be a strategy for fostering social interactions among students, but group work when the members haven't met in person can pose challenges, which could be exacerbated in intercultural groups (Kimmel and Volet 2012). While some students prefer to choose their own groups and rate the experience higher than randomly assigned groups (Chapman et al. 2006), self-chosen groups may be hampered by pre-existing social dynamics (Reinties et al. 2013). In group work that will occur outside of synchronous meetings, consider also surveying students for their preferred work times (time of day, day of week, also relative to deadlines), to minimize group scheduling conflicts. Offering the option for students to work alone or in groups allows for more flexibility with chaotic schedules.
- *Break the ice*. We encourage ice-breakers to facilitate social interactions among peers. Research shows that working towards a shared goal is an effective focus for ice-breaker activities (Tolmie and Boyle 2000). This could take the form of working through a metacognition activity on what it means to have a growth mindset. For example, asking teams to work through the WOOP methods (Oettingen 2014) of mentally contrasting what barriers they might face during the term and how they plan to overcome them can help build engagement, camaraderie, and resilience.

- *Allow opportunities for feedback.* We also advocate opportunities for students to share how the group is working. This can be done asynchronously with an anonymous discussion forum on a LMS, or through surveys. A dedicated social media page, hashtag, or handle for the class can also be helpful as some students are more likely to engage socially on social media than on a LMS platform. This also leads to them friending each other, posting relevant articles, etc., which are all great forms of engagement. A few of us have had great success using these handles for large classes, but they have to be monitored for offensive content.
- *Make collaborative expectations explicit*: We typically find animal behavior students have high natural interest and internal motivation to conduct their lab work, and that they collaborate well together. However, the remote format may reduce camaraderie among your students and bring to light other issues of equity. Consider having groups develop their own contract of group expectations and penalties for lack of compliance, and for team members to keep weekly logs in Google collaborative suite (or similar) of how much each person has worked on the project and what they contributed. Both of these approaches help with accountability and motivation. When you meet with each group, you could review the logs with them to help with team dynamics.
- *You are also part of the social group.* We also recommend fostering social interactions at the start of the term by acknowledging that the circumstances are not ideal and that we know students are dealing with unique challenges. If you are new to, and uncomfortable with, the online approach, be upfront about that.

To help students feel more connected with you, consider approaching lectures with a conversational style versus being more formal, and interjecting humor. You do not have to be a TikTok star or David Attenborough, but let them get a feel for who you are (i.e., be you). Consider starting each class with the whiteboard (for synchronous) or discussion board (for asynchronous) prompt like "What are you finding the easiest/hardest this week?"

Lecture Recommendations

The lecture portion of classes may initially seem to require little decision making beyond whether the content should be delivered synchronously or asynchronously. However, there are many other factors to consider, each of which may impact comprehension and retention of material, inclusivity of the learning environment, and stress levels of students and instructors.

Maximizing Comprehension and Retention of Material

In the General Recommendations section above, we emphasize that given the synergistic challenges faced by students and instructors alike, we should prioritize fostering a sense of community over maximizing course content. Nevertheless, content is important, and we should strive to deliver meaningful learning experiences to students in our behavior classes and to minimize the disruption to their degree progress. As higher education suddenly moved to a virtual format in early 2020, instructors and students experienced the difficulties associated with learning solely by watching computer screens. Many students find it a challenge to pay attention, take good notes, and retain course material in the absence of social interaction, which would

normally afford opportunities for learning by teaching others, asking quick questions of instructors in the halls, and forming impromptu study groups. Furthermore, both instructors and students experience “Zoom fatigue” (e.g., Blum 2020), such that staring at a screen for prolonged periods makes it difficult to remain engaged with the material. However, implementing the suggestions below when preparing online lecture content may ameliorate these problems.

- *Lecture duration*: We are all spending more time online, so the likelihood of habituation to this environment is high; thus, shorter lectures are usually a better option than longer ones. Student attention span for watching lecture videos wanes after approximately 20 minutes, based on recordings made in a lecture hall (Bauer et al. 2019), and may be even shorter given that the pandemic has resulted in physical distancing and, for some, an entirely virtual learning environment. Students also strongly prefer shorter online lectures (Velegol et al. 2018), and thus are more likely to remain engaged by them. Another complication to consider, however: when topics include several shorter videos, students are less likely to watch them all (Beatty et al. 2019). In general, we suggest either producing several short videos or clearly advising students to watch longer videos in stages. It is worth noting that students in Beatty et al. (2019) reported greater likelihood of viewing all the lecture videos for a particular topic if they perceived them as valuable. Incorporating active engagement within videos (see below) is thus likely to increase the chances that students engage

with all of them. In addition, reaching out to students who haven't completed all the lectures in a module can improve participation (van Oldenbeek et al. 2019).

- *Are you in the picture?* Seeing your face helps personalize the experience; on the other hand, using a picture-in-picture mode may obscure or distract from slide content. This can be ameliorated by independently posting PDFs of your slides. Feel free to mix it up – you don't need to be in every slide if it's not useful, but appearing in opening and/or closing slides can help students feel connected to you. If you're recording multiple lectures in succession, consider changing clothes and locations between lectures.
- *Quality control:* As anyone who studies vocal behavior knows, it's important to check your recordings to confirm volume and clarity. At minimum, listen to the first and last few seconds of each separate recording, as cut-offs are most common at beginning and end. If you are learning the technology or recording in a new location (e.g., home office instead of work), it's worth listening to at least a few videos in their entirety. Other issues to consider, independent of the recording quality, is the quality of your intonation and speed. Do you trail off at the end of sentences too much? Are you talking too fast? Is there too much echo? You do not need studio quality production values, but be sure you are clear. See also Inclusivity and Equity, below, with regard to checking closed captioning and transcripts.
- *Mix modalities:* Further counter habituation by introducing dynamic visual elements to your lectures, instead of just "talking over slides". Use highlight or drawing tools in your lecture platform to emphasize aspects of your slides (similar

to using a pointer in a face-to-face class). You can also incorporate video or use a digital whiteboard. The latter may be built into your lecture platform either as a separate feature (e.g., Zoom) or by the ability to draw on slides, using blank slides as “whiteboards” (e.g., VoiceThread). Alternatively, you can use your tablet or separate web-based app (e.g., Limnu, which also allows for separate break-out rooms). Remind students to take especially good notes when delivering challenging content, and to pause videos when they notice their minds are wandering. In an asynchronous class, short videos can be embedded in mixed-media pages that also provide written passages, graphics, links to internet content, PDFs of literature articles, and assignments/activities, all of which can be used to convey information that face-to-face classes might normally deliver in a lecture format.

- *Slide duration:* More slides with less narration on each makes it easier to edit your narration if necessary, and easier for students watching asynchronously to ask questions about particular points.
- *Slide numbers*: Number your slides (if your video lecture program does not do so automatically) and ask students to jot down slide numbers in their notes when they feel the material is not resonating with them.
- *Eye to the future:* While you may not be planning to teach online again, you may find it useful to reuse some of your lectures in the future: as part of flipped class or independent learning activities for students who miss class due to personal emergencies, or as make-up activities following extended campus closures for weather, for example. If you can foresee such uses, limit comments related to

current events or class schedule (assignment deadlines, etc.) to introductory or concluding slides.

Inclusivity and Equity in your Lectures

Both the COVID-19 pandemic and online learning environments disproportionately disadvantage students from underrepresented groups (e.g., Zhang et al. 2020). Therefore, it is even more important that lectures be planned and delivered in a manner that prioritizes accessibility and inclusion. Some strategies to consider:

- *A sense of academic belonging:* Do you highlight the work of underrepresented scientists? As you will almost certainly be revising your lectures for the online environment, now is a fine time to decenter your syllabus from a Eurocentric, Judeo-Christian, colonialist worldview (#DecolonizeYourSyllabus). Lee (2020) provides an excellent starting point for expanding how you represent diversity in the field of animal behavior (see also #BlackinAnimalBehavior). Consider also how you discuss the work of scientists who espoused racist, sexist or otherwise offensive views.
- *Consider bias in the science, not just the scientists:* Review the examples you choose to illustrate key points. Do all of your sexual selection examples feature choosy females and aggressive males? Is sexual behavior solely reproductive and heterosexual in your syllabus? Is parental care a female enterprise, except in so-called “sex role reversed species”? Update your lectures to represent a more modern understanding of these topics and alternative hypotheses from a different theoretical lens (e.g. Monk et al. 2019). Consider also explicit discussion of the

history of topics where bias has influenced the field (for example, “Bateman’s Principle”, Hoquet 2020).

- *Equity in access:* Record synchronous lectures (be sure to notify students that they’re being recorded), and do not require synchronous attendance. Ensure all posted documents are in a format that supports optical character recognition (OCR) so that they can be searched and are available for text-to-speech programs.
- *Protect privacy:* For a variety of reasons, some students require their privacy to be maintained when online (Casey 2020). Permit flexibility for students who are uncomfortable turning on cameras for synchronous lectures or activities, and honor their use of a pseudonym. (Note that not all devices are capable of using a photo as a background to maintain privacy.)
- *Design for all:* Recording synchronous sessions and providing closed captioning/transcripts are examples of how designing for inclusion improves learning for everyone. Not only are both essential for accessibility, but they also provide opportunities for reinforcement that can improve attention and understanding for all students. Most lecture platforms automatically provide closed captioning now (note: Zoom can provide full transcripts of recordings, though only when saving video to the cloud; you can also upload to YouTube for captioning).
- *Check transcripts*: Sometimes words and phrases may be mistranslated in ways that can disproportionately impact hard-of-hearing students. You don’t need to spend time correcting vocal tics, but there may be major errors. While there may

be cases where the mistranslations are humorous (e.g., collared peccaries' group dynamics = collared pecker ease group dynamics), other cases can be offensive (e.g., brown versus black alleles = brown versus black illegals). It is worth letting students know that transcription is automatically generated, and ask them to let you know if there are egregious errors that you didn't catch (possibly with extra credit rewards). In some platforms, closed captioning cannot be edited, but transcripts can.

Fostering Engagement While Minimizing Stress

Students and instructors are dealing with the synergistic crises of a global pandemic, social injustice, and changes in living and financial circumstances; anxiety is widespread (Brown and Kafka 2020). It is therefore not surprising that students report feeling low engagement with course content (Lederman 2020). How can you counter this anxiety while helping your students succeed in your class?

- *Foster active engagement:* Even asynchronous lectures can be active. Consider including question slides that students can answer by commenting; some platforms (e.g., VoiceThread, Kaltura Capture) allow student comments to remain private, so comments can serve as mid-lecture quizzes. Frequent quizzes enhance student learning (DeLozier & Rhodes 2017), and scattering questions through the lectures may help maintain student focus. Polling apps that you may use in your face-to-face classes (e.g., Kahoot!, PollEv) can be adapted for both synchronous and asynchronous use.

- *Encourage social interactions:* Even asynchronous lectures can include social connections. Many platforms allow for (and automatically track) student comments on lectures; giving low-stakes credit for comments or questions (either directly on the slides or on each other's comments and questions) allows for student interaction even in asynchronous lectures. Some platforms (e.g., Zoom and Big Blue Button) have integrated polling features that can be used as breaks or to foster discussion in synchronous lectures. You can also pose questions in the lecture and ask students to respond in another forum that involves social interaction (e.g., discussion board, Flipgrid, social media). Asking for participation in a virtual format may even be more successful than in face-to-face environments, because otherwise reluctant students may be more comfortable in some of the alternative discussion formats.
- *Be kind, be honest*: While our circumstances differ, we are all living in extraordinarily difficult times; your class is not a separate universe. There's no need to pretend you are a "robo-instructor", unaffected by or unaware of world events. A few occasional words of "checking in" at the beginning or end of your lectures, acknowledging the stresses we are all under, and that you, too, are learning how to navigate our current reality, will help students feel less alone in your class and in general, and may help them feel more willing to engage.

Discussion Recommendations

Discussion is a key component of most animal behavior classes, and so considering how to replicate this experience in online courses is important. Depending on your delivery mode, discussions can be held synchronously (either via video or chat rooms)

or asynchronously (via discussion boards, etc.). While many of us are likely more comfortable with the synchronous approach, we found that some students in our spring 2020 courses, forced into online formats by the pandemic, really enjoyed the asynchronous discussions as they gave them more time to develop their questions and compose thoughtful replies relative to their experiences in live class discussions. Here are some suggestions:

- *Discussions of core principles, experiments, or current research*. As with any discussion, a good prompt is critical; prompts can be either self-written or, if you're using a textbook, you can take advantage of chapter questions. Turning in written answers to these prompts prior to a class discussion offers another low stakes assignment that could be graded for participation, and also helps instructors know the level of understanding students have of the reading. Students can then be assigned to groups to discuss their answers either synchronously or asynchronously.

    Asynchronous discussions on a discussion board can be effective if planned well. It is often helpful to break students into small groups within the LMS when assigning discussion prompts, because this avoids the repetitive student answers that sometimes plague online discussion boards. Individuals within each group can then be assigned different prompts. For example, if the topic is to discuss a small set of questions about a literature article, students within the group could each be responsible for presenting an initial answer to one question that other group members are then tasked with improving. We also

have found it helpful to use the “reply before seeing other posts” option available in many LMSs so that students must craft their own responses before seeing and responding to those of others. Another tip is to require students to make responses at two or more different time points, increasing the opportunity to engage in back-and-forth conversation. Discussions can be easily graded mini-assignments. They are often amenable to single-point satisfactory/unsatisfactory marking, while more elaborate posts can be evaluated using rubrics. Finally, we encourage faculty to be cognizant of their direct participation in discussions; students should perceive that you are reading their posts, but student participation can sometimes be stifled by frequent instructor commentary. A weekly summary post by the instructor, where we reflect upon interesting student ideas that emerged from the various groups, and add insights of our own, can often be an effective and time-efficient mechanism to recognize student participation and take advantage of teachable moments.

- *Journal club.* Another fruitful option for discussion is having students take turns leading discussions of primary literature articles. You might want to model the first one. Be sure to provide explicit expectations for the discussion leaders, and encourage them to outline the paper carefully. This both improves their understanding, and provides a reference example to use in their own writing process. In more advanced classes, leaders may be asked to also provide additional content, such as learning goals for the discussion and/or information from background readings. To ensure the rest of the class is adequately prepared for a lively discussion, you can require some preparation assignment

be due prior to class (such as identifying key points and questions regarding the article); alternatively, provide explicit expectations for discussion participation and perhaps provide alternative means of participation for those uncomfortable speaking up.

- *Invite guests.* If you're discussing an article, consider inviting the author to join in the discussion, either through a synchronous format like Zoom or by answering questions that remain from an asynchronous format (either via pre-recorded video or text). Here is another excellent opportunity to highlight the work of a diversity of scientists from different racial and cultural backgrounds. As the Animal Behavior Society conference is offered virtually in 2020, the short video presentations of current research offer a unique opportunity to incorporate presentations from a variety of scientists into your class, and could be the seed for discussions.
- *Case studies:* Even in an online environment, case studies continue to be excellent fodder for discussions focusing on specific topics in behavior, as well as the process of science. For example, the National Center for Case Study Teaching in Science (NCCST; https://sciencecases.lib.buffalo.edu/) has a wealth of published cases relevant to courses in animal behavior. Many of these are designed to use an interrupted case pedagogical approach, with periods of in-class small-group discussion punctuated by new information or prompts provided by the instructor. While one could stage this in a synchronous video classroom, these cases can also be transitioned into an asynchronous format, using LMS restrictions to ensure students progress through the assignment in the correct

sequence. Alternatively, steps in a case study can be posted over multiple days by the instructor, and students can then discuss each step in a threaded discussion board.

Assignment Recommendations

One lesson from spring 2020 was that students felt overwhelmed by the new workload. Some instructors compensated for the shift to an online format by including too many assignments. We strongly encourage you not to overload students with excess work. Instead, thoughtful, flexible assignments enhance student learning without adding a heavy grading burden on the instructor. Be sure your assignments directly connect to your prioritized learning outcomes (See Course Design, above). Flexibility gives students multiple paths to success. We give some ideas for types of assignments that can work well in online courses. While obviously not an exhaustive list, these serve as examples of assignments that work well in the online environment.

As a general rule, the benefits of more, low-stakes items exceed those of fewer, high-stakes items. Low-stakes assignments can maximize student engagement and learning while minimizing stress, because no one assignment contributes a great deal to their final grade. One way to do this is with weighted “pools” of low-stakes assignments which are individually small grade contributions, and can be placed into weighted categories of different assignments, quizzes, etc. You may also want to consider alternative grading schemes for your assignments to help empower students in their own assessment, further lower the stakes, or reduce time strain on grading.

Larger, higher-stakes assignments have an important role to play as well. Even more so than in face-to-face classes, it is critical that longer assignments be highly

scaffolded. Students engage more with class material on their own in online classes than in face-to-face classes, and so they need clear instructions and guidance through each step of these higher-stakes assignments. Depending on how they're employed, the following examples could be viewed along a continuum of low to high stakes assignments:

- *Self-evaluation:* Providing opportunities for self-reflection can serve as a type of "ungrading" assignment (Flaherty 2019). Here, you provide clear cut ways for students to self-assess their performance and grade themselves, which can empower students and encourage them to think more critically about what they can do to improve. Specific prompts are key. Consider asking students to assess their own work relative to provided rubrics, or to reflect on their note-taking skills, approach to studying, or engagement with reading assignments. You can ask them to outline a chapter, summarize the learning objectives from it, or respond to scaled questions about how completely and carefully they completed the assigned readings.
- *Short, task-based assignments:* Students can be required to observe an animal, and then construct an ethogram, develop a list of proximate and ultimate questions, and/or post their informal observations and inferences with prompts like "I noticed…" or "I wonder…" To encourage discussion, students could then be asked to respond to their peers' work by, for example, proposing alternative questions or explanations.

- *Creativity-based assignments:* Provide options for students to engage with course content in creative ways. Ask students to write a limerick or haiku about a concept or article and post to the discussion board (or tweet @Science_Poetry); this type of assignment can help them focus on the key takeaways without resorting to patchwriting or feeling self-conscious about "sounding scientific", and it will reveal to you quickly how well they're comprehending the ideas.
- *Abstracts:* Writing a strong abstract requires solid understanding of a study's broad context, hypothesis, methods, statistical analyses, conclusions, and implications, and requires good synthesis skills. Thus, an abstract assignment can serve as a relatively low-stakes way to assess student understanding. For lab projects, consider reducing some of your formal lab report assignments to only an abstract. For an advanced class, perhaps require a "stats appendix" that demonstrates the statistical approach students used to generate their conclusions. For class activities that require students to read primary literature, provide them the paper without the abstract and ask them to write it themselves.
- *Peer review:* For any type of writing assignment, incorporating peer review increases student interaction and the ability to learn from their peers. Thoughtfully design rubrics to guide students in their assessment, avoid yes/no responses, and prompt detailed comments. For example, 'Propose two specific suggestions for how the author can improve their Methods section' is better than 'Are the methods clearly articulated? Does the author provide the appropriate level of detail?' For advanced classes writing manuscript-style lab reports, you can promote authentic practice of professional work by using the reviewer

questions for specific behavior journals. Peer reviews can also be incorporated into other types of assignments (for example, see Mock Grant Proposals, below).

- *Primary literature dissections:* Students can be required to find primary literature articles related to current course topics, and post very brief and targeted summaries that ask them to deconstruct the article: for example, identifying the primary question, experimental design, primary results, and conclusion. A more focused alternative: ask students to post one figure from a primary literature article, state what question the authors were asking, experimental design relevant to that figure only, and how that figure contributes to the overall interpretation. These short assignments are easy to grade, yet provide students with opportunities to explore how interpretations are constructed in science. Students can also be asked to comment on each other's posts, proposing alternative interpretations or summarizing the posted results in verse (see *Peer-review,* above). Social annotation of articles (see Table 3 for software options) works particularly well here to encourage a deeper and communal reading of texts.
- *Student presentations:* Students can present their work (from either lecture or lab course components) in either synchronous or asynchronous formats. For reasons of equity detailed above, we suggest pre-recorded presentations that can be viewed and responded to asynchronously via discussion boards. Many applications used in asynchronous lectures (e.g., VoiceThread, FlipGrid) allow for text, audio, and video responses from classmates, furthering opportunities for asynchronous discussion of student work. However, we note that there is often

great camaraderie to be found in synchronous meetings online where student presenters can be asked questions in real-time after their pre-recorded presentations are played by a moderator.

Because pre-recorded presentations can be readily shared, consider working with your department or institution to develop mechanisms to communicate student work outside the classroom via social media platforms and poster sessions. Also consider the value of developing assignments targeted for the broader community that may take the form of popular science radio clips (like those at birdnote.org) and vlog posts to be shared with local zoos, conservation organizations, museums, K-12 classrooms, and more.

- *Mock grant proposals:* Regardless of class format, mock grant proposal projects provide excellent opportunities for students to take ownership of their learning and select a topic they are personally motivated to learn more about. Guidelines for the final product can follow those of real graduate student grant programs such as the Animal Behavior Society's graduate student grant or the National Science Foundation Graduate Research Fellowship Program. We recommend a highly structured and scaffolded development of the project, with multiple low stakes assignments guiding the students towards the development of a truly innovative proposal, and providing multiple opportunities for students to share and compare their ideas throughout. These opportunities can be structured synchronously during live class or lab time, or asynchronously via pre-recorded short presentations. The scaffolded development could include: Step 1: sharing broad topics of interest; Step 2: presenting a key "anchor article" that has been

foundational in a given student's development of their proposal ideas; Step 3: recorded "elevator pitch talks" and written drafts; Step 4: peer-review discussions; Step 5: final proposal submissions; Step 6: peer-review panel discussions to determine who gets "funded". Sprinkle in one or two required one-on-one conversations between student and instructor, and give plenty of feedback and encouragement along the way. We have seen these projects help our graduating seniors find their graduate school mentors! We have also watched students' eyes grow wide when we show them a recently published article testing the same questions they have proposed, illustrating how they have been generating truly novel and significant questions in behavior. It can be inspiring and transformational for students and faculty alike.

- *Course wrap activity:* Ending with a low stakes assignment can bring a sense of refreshment after high stakes assignments and exams. Online courses especially can have a feeling of ending abruptly, leaving students with a sense of being dropped. Reflection pieces work well here, such as writing a letter of advice to next year's class about how to succeed and what challenges to work through. You can share the best ones with your next class!

Testing and Assessment Recommendations

Perhaps no aspect of teaching online triggers as much angst in instructors as the question of how to give exams. Testing in an online environment is fundamentally different from testing in a classroom. As with other aspects of developing an online course, however, you may find that testing and assessment techniques applied in an online environment become your preferred techniques in face-to-face classes as well.

With the pivot to online classes in the spring, many institutions subscribed to online proctoring services. If you want to try to mimic the in-class exam experience, you can use one of these (e.g., Respondus). However, note that these options often add to student expenses, place additional technological constraints on students, and have raised privacy concerns. The use of these services also reinforces an adversarial, rather than collaborative, relationship among students, and between students and instructors. For these reasons, we discourage lockdown browsers and webcam monitoring during assessment activities such as exams.

Fortunately, there are alternative approaches, many of which are well-suited for animal behavior classes. It's worth considering why students might be tempted to cheat: anxiety, the high stakes nature of exams, the preparation "gap," and most influentially, peer behavior, which can normalize cheating and instill fear that other students are cheating and "getting ahead" (McCabe et al. 2001). Taking these reasons into account, we outline some alternative approaches below. While these alternative approaches can be challenging to implement at first, especially while trying to minimize the grading burden, they are also readily applicable to face-to-face classes – you may find that you never want to give a "traditional" exam again.

- *Lower the stakes:* Replace high-stakes exams with frequent low-stakes quizzes (i.e., at least one per topic or module). In addition to lowering the benefit of cheating on any one quiz, this strategy helps keep students from falling behind or procrastinating, while providing you with a much more fine-grained analysis of what students do and do not understand, allowing for a more adaptive approach

in your teaching. Frequent low-stakes quizzes reduce student anxiety about the "preparation gap" and also work well with a specifications-based grading scheme (see Course Design, above). Perhaps most importantly, frequent testing is not just an assessment tool, but also a highly impactful teaching technique. Indeed, in a review of frequently used active learning methods, frequent quizzing was found to have the most support in terms of effectiveness in improving student learning (DeLozier & Rhodes 2017). In other words, think of frequent quizzes as a critical part of your teaching, not its endpoint.

- *Everything's "open-book":* Chances are, relatively few of your regular animal behavior exam questions ask for memorized (or googleable) and regurgitated factoids. For online assessments, write questions with the explicit expectation that students will (and should) consult their notes or other course resources. Focus on questions at higher levels of Bloom's taxonomy: ask students to interpret data, explain relationships, design experiments, and solve problems. This can be challenging to do without generating an unrealistic grading burden (but see "*Include a mix of question types*", below), but opens up important avenues for reconsidering assessment that may carry over beneficially when face-to-face teaching resumes.
- *Honesty affirmations:* Ask students to write a sentence on their quiz/assignment that affirms that they have not received help from anyone else to decrease the temptation to cheat. By actively affirming they are honest and not "cheaters," students should be less likely to cheat. People tend to avoid implicating

themselves of unethical behavior (Bryan et al. 2013), and students are less likely to cheat if there is a perceived culture of academic integrity (McCabe et al. 2001).

- *Include a mix of question types:* When giving frequent quizzes in large sections, there's no shame in using multiple choice questions, but including at least a few short answer questions on each quiz helps provide additional insight into what students are learning and give them vital practice writing about science. Multiple choice questions at high levels of Bloom's taxonomy can be challenging to write, but are well worth the effort. Consider using "multi-select" ("select all that apply") questions instead of single-choice multiple choice questions, to allow for partial credit (further lowering the stakes and rewarding partial understanding) and to avoid favoring students with extensive standardized test training. Avoid single-answer multiple choice with combined answer options (ex. A & B, all of the above except C, etc.), as these penalize partial knowledge and reward students with extensive standardized test training. Matching and fill-in-blank formats are also useful for higher order questions, and can be autograded (but always check the latter for unexpected but correct answers).
- *Quiz delivery dos:* Take advantage of your LMS quiz settings to minimize sharing of quiz information: display one question at a time in random order; randomize selections in multiple choice questions; and build question banks (so not all students receive the same questions).
- *Quiz delivery don'ts*: Some common recommendations for preventing cheating can be quite harmful to students and impede learning, so these we recommend you avoid. Do not restrict students' ability to move backwards in the quiz.

Remember, taking the quiz is part of the learning process, and if a later question helps a student realize an earlier mistake, that's a good thing. A common study strategy taught to students by university disability services is to skip questions they aren't sure about and return to them later, so preventing backtracking could be disadvantageous to students with testing accommodations. Also, do not overly restrict the quiz time period or quiz duration. Students will run into technological problems, and are unlikely to be working from a distraction-free environment. Provide a large time window in which to take the quiz (a full day is not too long, especially if you have students in many time zones and/or who work full time or have family responsibilities), and a longer quiz duration (2-3x) than you would for a similar length face-to-face assessment.

- *Oral exams*: If the class size isn't too large, oral exams are another alternative, and can be conducted synchronously or asynchronously (with students recording their responses); they can also be conducted individually or in groups (see below).
- *Collaborative assessments:* We almost never operate in isolation as scientists, so aligning your assessment practices with professional practices to be more authentic could manifest as collaborative exams. This could be in the form of short essays or oral exams. Clear guidelines are needed to establish that part of grade is ensuring participation and equal mastery of learning objectives from all group members, and how you'll be assessing the quality of the contributions. In addition to increasing student engagement, collaborative approaches result in less items to grade, making it more feasible to incorporate essays and oral

exams into larger classes. (See also recommendations with regard to groups in Course-wide Recommendations.)

- *Combined individual and collaborative assessments*: One limitation of collaborative assessments is that students may distribute the workload such that no student fulfills all the intended learning objectives. One mechanism to prevent this is a 2-stage structure: students first complete the assessment individually, then re-take (or take a modified version) in groups. The grade is a predetermined ratio of independent and group attempts (typically with a caveat that group grades cannot lower individual grades).
- *Alternatives to exams*: Exams don't reflect any aspect of professional practices and while frequent quizzing enhances learning (DeLozier & Rhodes 2017), infrequent long exams are unlikely to promote long-term retention of material. Thus you may want to consider replacing them entirely with alternate options. Reflection statements in response to a general prompt used throughout the class or specific prompts highlighting key principles of each course module can be impactful ways for students to interact with material. Reflective writing requires students to use writing as a natural part of the thinking process, summarize information, and integrate content. As a result, engagement with course material is enhanced, knowledge can be personalized and contextualized, and learning is deepened (Tewksbury 1996; Fuller 2017; Chang 2019). Reflection portfolios can be written for the instructor's eyes only, or can be peer-responded (Gopen 2005); a peer-response approach could be particularly helpful in online classes as another way to help build community among groups of students. We encourage

you to allow students space in their reflections to comment on their learning process itself, including their engagement level in class, challenges faced, etc.

In lieu of a final exam, consider an alternative assignment focused on a skill-development learning goal instead of a content-based learning goal (see Backwards Design). For instance, written analyses of data sets or journal articles are valuable ways to assess the development of key academic skills your students have developed through class paper discussions and other course components. If community-building was a critical course goal, consider allowing these final analyses to be performed collaboratively by student groups.

- See also the Assignments and Discussion sections for more ideas that could be weighted heavier to replace traditional exams.

Laboratory Recommendations

Animal behavior labs are often immersive, hands-on, and require working with live animals. At first glance adjusting for a face-to-face physically distant lab experience may feel somewhere between arduous and impossible. And yet, with careful choices and planning, one can offer meaningful and intellectually rewarding lab experiences, including authentic and collaborative research opportunities.

As with lectures and discussions, the first decision one must make regarding labs is about the mode of instruction (see Modes of Instruction, above). Will you develop socially-distant in-person labs or an online approach, either synchronous or asynchronous? Revamping all of your labs to meet physical distancing or virtual requirements can feel daunting. Keep in mind that laboratories do not need to be weekly stand-alone exercises (i.e., a 15 week course does not need 15 different lab activities

each on a different topic), and that students can benefit from multiple-week and term-long projects. By carefully scaffolding these projects with multiple low-stakes assignments that culminate in a final paper, proposal, poster, or presentation, lab time can be used to support student efforts, encourage peer-to-peer sharing of information via informal presentations, and more. For instance, several of us typically teach our face-to-face courses with only a few weeks of “standard” lab exercises developed to teach basic observation skills, ethogram construction, use of event recorders, and experimental design. The remaining weeks of lab are used to support term-long research projects including: a collaborative study at local zoo, aquaria or animal shelters, and/or the development of individual mock Animal Behavior Society graduate student grant proposals. While these labs still require careful redesign for the remote format, the structure simplifies the process by reducing the total number of “topic-based” labs to be reimagined for the remote learning environment.

Behavioral scientists are a creative group that has fashioned a variety of ingenious ways to wrangle animals (and teach students), and will likely devise labs that far surpass our recommendations here (e.g., the shared google folder on behavior labs and assignments). But even so, we offer some suggestions for both physically-distanced in-person and entirely remote online labs.

Physically Distanced In-Person Labs

For in-person instruction, laboratory rooms generally need to be at 30-50% capacity to meet the guidelines for physical distancing (based on room size). This means that for each lab session, only one third to one half of your students are present. In this situation, a cohort approach is best because it does not require additional instructors or

physical lab space. Be sure that all shared equipment is disinfected before and after use using disinfectant wipes or 70% ethanol.

- *Cohort approach:* In a cohort approach, you choose a handful of the most important labs that need to be in-person and cycle subsets of your students as cohorts through those labs over the course of the term, while putting the remainder of the labs online. Alternatively, if this is not feasible because you are doing multi-week experiments, you can shorten the in-person time spent in the lab room and have cohorts arrive at different times: for example, half of the students arrive for the first 2 hours, clean the lab for 15 min, and then the other half arrive for the last 2 hours. Keep in mind that the staffing required to prepare labs may be at a reduced capacity and, if you are using animals maintained in colonies, the animal care staff may also be at reduced capacity. Coordinating with your director of laboratories (if you have one) to meet the required distancing guidelines at your institution should be done early and often.
- *Outdoor labs at a fieldsite:* Behavior labs may have the option of meeting outside, which allows for more physical distancing and reduced viral transmission rates. Labs that focus on observing animals in the field can use this approach effectively. Staggering the times that students come to the fieldsite can reduce contact time, but can be logistically difficult for off-campus sites. Thus, easily accessible on-campus sites should be prioritized when possible, and safely managing travel to off-campus sites by car or public transportation needs to be

carefully considered. For safety reasons, students should always be accompanied by an instructor or teaching assistant when in the field.

Entirely Online Remote Labs (Synchronous or Asynchronous)

For labs which will be held remotely, there are a different set of considerations. Again, the first consideration is mode of instruction: synchronous, asynchronous, or a combination. The second consideration is the structure of the lab exercises and the amount of student-to-student collaboration you expect online.

- *Fieldwork:* You may decide to have students do field observations remotely by asking them to conduct in-person data collection near their homes. Depending on the student's location, song birds, shorebirds, water fowl, squirrels, insect pollinators, cockroaches, flies, ants, and spiders may be readily available subjects. Students could use community science mobile applications like eBird and iNaturalist to submit checklists of observations, submit short videos of behavior they observe near their homes, or conduct independent research projects. These projects should remain strictly observational to eliminate the need for Institutional Animal Care and Use Committee (IACUC) approval or other institutional, local, state/provincial or federal permits, especially if focused on vertebrate and other protected animal groups. If a student proposes to observe human behavior or use social media platforms for data generation, be sure to consider requirements for Institutional Research Board (IRB) approval. Observations of people should be conducted only in public spaces and with no personal identification.

One important consideration for remote fieldwork is that it is hard to ensure student safety, even in local public parks (see Mock 2020; #BlackBirdersWeek, #BlackInNature). Minority, LGBTQIA2+, and female students alone in the field are vulnerable targets (#MeToo, Flaherty 2017). To overcome this obstacle, one can suggest observations in a public zoo or private backyards. However, note that backyard field observations may not work for all students and raise issues of equity. Overall, we recommend a flexible approach that allows for students to choose individual fieldwork if they wish, but also provides at least one of the other options below as equal alternatives for lab projects, and not as an individual accommodation or lesser Plan B. The most important rule is safety first!

- *Remote study subjects:* Rather than relying on face-to-face observations of animals, instructors can take advantage of other excellent sources of study subjects including live nestcams, zoo livestream feeds, or pre-recorded videos of animals (Table 1), including experimental trials that are video-recorded by you and/or your colleagues. Additionally, you may opt to make and post video recordings of the same animals that students would have typically viewed in-person during a lab exercise. Students could view these recordings and do much of the same work they would have done in person. Libraries of sound recordings (Table 2) also have great potential for use in remote lab exercises.
- *At-home study subjects:* Depending on your departmental resources, it may be possible to mail simple kits to each student's home. Aphids, bean beetles, ants, and zooplankton may all be reasonable possibilities here. Students can observe

these animals, construct ethograms, develop and test simple experimental designs, and present results to their peers. Keep in mind the need to ensure ecologically sound and humane endpoints for these animals. If your ability to oversee this critical step is uncertain, we advise against such kits.

- *Datasets:* While encouraging students to directly observe behavior has obvious benefits to our classes, datasets can also be used effectively to help students test hypotheses, analyze data, and practice graphical construction and interpretation. Such datasets can come from the published literature, community science mobile apps (see software recommendations below), your and your colleagues' personal research, and/or previous class-based lab exercises.
- *Collaborative studies:* Remote and at-home study subjects do not remove the possibility of students collaborating in groups. For example, pairs of students living in different geographic regions can agree to a study plan and later combine their field observations to make comparisons across populations. Similarly, teams of students could examine nestcam options, conduct basic observations of at-home study subjects, or review potential datasets. Then, they could develop a research question and sampling methodology together, and share data collection and analysis duties. If students do work on lab projects in groups, time should be provided for the collaborative process, whether that is done synchronously during scheduled lab times or asynchronously.

Given the global pandemic, many animal behavior classes world-wide will be conducted online. This unique situation provides opportunity for collaborations that extend well beyond a single class to form national and international student

research teams that work together to collect large amounts of data and address questions with an explicit geographic component – something that would be difficult for students to explore in a typical face-to-face format.

Table 1. Example sites to find live webcams and pre-recorded videos.

Live Webcam	URL	Highlights (more on site)
San Diego Zoo	https://zoo.sandiegozoo.org/live-cams	Variety of vertebrates: hippo, platypus, baboon, polar bear, apes, tigers, elephants, giraffes, koalas, penguins, burrowing owl and condor
Smithsonian National Zoo	https://nationalzoo.si.edu/webcams	Variety of mammals: black-footed ferrets, elephants, panda, cheetah, naked mole rat, lions
Georgia Aquarium	https://www.georgiaaquarium.org/webcam/beluga-whale-webcam/	Variety of vertebrates; Beluga, sea lions, alligators, southern sea otter, puffins
Monterey Aquarium	https://www.montereybayaquarium.org/animals/live-cams	Variety of marine organisms; coral reef, jellyfish, sharks, sea otters, kelp forest, open sea cam
Cornell Labs	https://www.allaboutbirds.o	Variety of live bird cams from

	rg/cams/explore-the-new-bird-cams-website/	across the United States, Canada, Panama, Carribean, and New Zealand
Audubon	https://www.audubon.org/birdcams	Live bird and nest cams

1184

1185 Table 2. Example sites to find sound recordings.

Taxon	Site
Anurans	https://www.pwrc.usgs.gov/frogquiz/; List of Call and Video Files on AmphibiaWeb; Frog Watch | UserGroup
Cetaceans	https://patternradio.withgoogle.com/
Insects	https://www.ars.usda.gov/ARSUserFiles/3559/soundlibrary.html; http://entnemdept.ufl.edu/walker/buzz/
Rodents	https://mousetube.pasteur.fr/
Birds	http://xeno-canto.org, https://www.macaulaylibrary.org/; https://blb.osu.edu/

Office Hours Recommendations

Instructor-student interactions, including those that occur outside the classroom and in office hours, are essential for student success (e.g., Wallace and Wallace 2001, Cokley 2000, Delaney 2008), and especially so in asynchronous formats. As physical distancing can contribute to social isolation that is detrimental to learning and wellbeing, office hours become an important opportunity for students to not only interact with the instructor but also with peers. Unfortunately, students do not always attend office hours due to insecurity about interacting with faculty one on one, time constraints, or simply because they are not aware of the benefits (Briody et al. 2019). A remote format for class and/or office hours might further exacerbate low office hour attendance, and yet even if your course includes some face-to-face components, you may wish to hold office hours remotely based on your office size, your balance between on-campus and at-home work time, and to optimize safe access for all students. Thus, a conscientious effort should be made by instructors to encourage participation. To increase student attendance in online office hours, you may wish to do some or all of the following.

- *What are "office hours"?* Many students may be unaware of the benefits of attending office hours, so explicitly discuss how this time can be used to improve comprehension of course material and assignment expectations, as well as for general mentoring and academic development. Clarify your personal goals for office hours and make it clear that you want students to speak with you (some students may think that office hours are private work time for faculty during which they are *not* to be disturbed). Also make clear (in the syllabus, introductory video,

and in frequent reminders) that office hours are not private because other students may be in attendance, and that private online meetings may be scheduled for those students who need it.

- *What's in a name:* Given student uncertainty about the role of office hours, consider reframing this time as "student hours" or "let's chat about behavior hours" – an opportunity for students to participate together, interacting directly not only with the instructor but with their peers. To maximize student engagement and collaboration, consider using virtual whiteboards, shared documents, and breakout rooms. Encourage students to attend even if they don't have a specific question; they can use the time to "work independently together" until questions arise.
- *Jumpstart attendance*: Students may feel intimidated and unwilling to make the first move. Require each student to attend an office hour in the first two weeks, either individually or in small groups, as one of their first course assignments. This provides opportunities for students to get to know their instructors and to become familiar with asking questions in a one-on-one or small group setting with their instructor, as well as providing the opportunity for the faculty member to get to know their individual students. Technology suggestions for scheduling one-on-one meetings includes calendars within your LMS or sites such as Google Calendar, When2meet, etc.
- *Keep reminding*: Students encounter a lot of information about course structure in the first days of classes, and it's easy for them to forget details or confuse details between classes. Frequently intersperse reminders of the times and

benefits of office hours during lectures and videos featuring particularly challenging content, and via periodic check-in emails.

- *Be consistent.* During pandemic teaching in spring 2020, many faculty noted very low attendance in virtual office hours and as a consequence, some dropped their regular office hours and encouraged students to contact them as needed to set up individual meeting times. While this allows maximum flexibility, it also reduces the likelihood of student to student interactions during these times, and disadvantages students who may have wanted to hear the discussions without necessarily participating actively. Thus, we encourage instructors to remain available at allotted times and simply turn off video and audio until someone arrives.
- *Be inclusive and flexible.* Flexibility is critical. Invite students to let you know if the times you've selected do not work for them and consider setting alternative or additional times; scheduling options discussed above can be useful for finding times that work for all. If your office hours are held via video, be sure to provide alternatives for students unable to access this medium, such as LMS chatrooms.

Once faculty and students become comfortable with the idea of online office hours, we see this as one component that may be effectively incorporated following the return to typical face-to-face class offerings. Of course, many of the above recommendations may also be successful for in-person office hours.

Resource and Software Recommendations

There are many varieties of software that can be used to enhance online instruction, ranging from those that enhance student engagement, to data collection, to community science. Here, we provide some recommendations for assessing which tools might work best for you (Table 3).

- *Start with your students:* At the start of the course, survey your students so you know their technological situations. Do they have access to the software and the hardware required to use those tools? Also provide a list of required resources in your syllabus (see Course-wide Recommendations, above).
- *Align technological tools with learning goals:* You are no doubt learning about a lot of amazing tools and resources right now. However, these can lead you to over-complicate your course (see Course Design, above). Ask yourself: Does the tool engage students to focus on the learning goals? Does the tool enhance what students would have learned more than if it had not been used? Does the tool extend student learning beyond the classroom and connect to their everyday lives? Assessing the level of engagement, enhancement, and extension (i.e., the Triple E Framework, Kolb 2017) is critical before deciding to use a particular technology in your course.
- *Simplify student experiences*: Be mindful of how many new tools you're asking students to learn for your course. Some tools can serve more than one function - even if you prefer how a second tool performs one of those functions, ask whether the performance of the second tool is worth students learning two tools

instead of one. Be mindful of how many separate accounts you're asking students to set up. Remember that some students will need to move between devices frequently, so the fewer sites, logins and passwords you ask them to remember, the better.

- *Scaffolding is important*: Just as you would not teach statistics in one lab and never use it again that term, you should not have "one-off" use of technological tools. Students and faculty both need time and space to adapt to a new tool. Just as statistics becomes more powerful and students gain mastery over time, so too is the repeated use of tools within scaffolded assignments (giving them time to develop confidence with the tool). Repeated use deepens students ability to use the tool, allowing them to focus on learning behavior instead of becoming frustrated with the software.
- *Community science:* Engaging with the broader scientific community is a wonderful way to introduce students to scientific life. You can mine the iNaturalist database of species and analyze species distribution of a target species or group (e.g., distribution of invasive species). Students can also contribute to the database. Recently, amateurs have identified never-before-seen mating behavior in arachnids and collaborated with expert curators on new projects through iNaturalist (American Arachnological Society online conference 2020). However, one must balance engagement with community science and data quality from students enrolled in your course, which may vary. For iNaturalist in particular, data quality matters in training the machine learning algorithm, so having students agree on an observation before submitting is one way to enhance

quality. Alternatively, students can use an application that interfaces with iNaturalist without uploading images to its database. Seek is a dedicated application that allows students to make observations that are not uploaded directly to the main database but benefit from the machine learning of iNaturalist to provide species identification for student projects. iNaturalist/Seek has the potential for students to use it to identify a plant in the field that an animal consumed as well as the animal itself. This instant identification can aid student-generated projects that are done remotely. Other community science initiatives include eBird, which generates freely-available data on bird distribution and migration; xeno-canto, which allows for study of geographic patterns in bird song; and Bumble Bee Watch, which focuses on native Bumble Bees.

Table 3. Useful Software Tools for Online or Hybrid Animal Behavior Courses

Software	**Why You'd Use It**
Learning Management Software (LMS)	Organizing & delivering content, collecting assignments, providing grades and feedback, and communication (both between students and between students and faculty). The LMS is the classroom for an online course. Ideally, other tools are either integrated with or can be linked to the LMS site.

Remote Conferencing Software Big Blue Button, Google Meet, Microsoft Teams, Zoom, Blue Jeans, WebEx	Synchronous class meetings; video lecture recording; generating lecture transcripts
Video Capture Software Camtasia, OBS Studio, Screencast-o-matic, Kaltura VoiceThread	Record screen and audio feeds, with optional inset webcam recording. Slide-by-slide annotation of PowerPoint or PDF slides (annotations by video and/or audio, drawing tools), student commenting; in-slide quizzes; collaborative text (pdf) annotation.
Collaborative Office Software Google Docs, Google Sheets, Office 365	Allows students to share and synchronously edit papers, lab notebooks, slides, & spreadsheets on group projects.
Software for Interactivity Kahoot!, Poll Everywhere Flipgrid	Mid-lecture quiz/survey software, similar to “clickers”

Jamboard, Limnu, Padlet	Short videos for presentations or asynchronous discussions
Notability	Interactive post-it or whiteboard brainstorming activities during online lectures.
Hypothes.is, Perusall	Collaborative note-taking/annotation of readings
	Social annotation of text that allows for collaboration
<u>Animal Behavior Data Collection</u>	
BORIS, JWatcher	Data collection for behavioral observations, for use in lab assignments.
Animal Diversity Web/Quaardvark	Data source for dry labs on comparative behavior and/or phylogenetics
Audacity, Raven	Visualizing and analyzing sound recordings
<u>Community Science Software</u>	
iNaturalist, Seek	Interact with a database that uses machine learning to identify taxa and has curators to

	validate data. Post photographs and determine ID's on flora & fauna. Advanced users can extract data on distribution maps, behavior, interact with expert curators, etc. Many projects that students can contribute to already listed.
eBird	Submit bird species data after observation periods. Can load regionally specific guides to birds that identifies rare and unusual sightings (and potential misidentifications).
Bumble Bee Watch	Bee identification, behavior, and distribution
<u>Taxa Identification</u>	
Merlin Bird ID (Cornell Lab)	Can ID birds by size, color, behavior or photo.
Audubon	Can ID birds by size, color, shape, activity, habitat, song, wing shape and tail shape.
Wild Bee ID, Bumble Bee Watch	Can be used to ID bees

Intellectual Property Rights

Intellectual property rights can vary widely from country to country, and from one institution to the next, so we have written this section in the broadest of terms. Professors are both consumers and creators of intellectual property, so both sides should be considered. Conduct a fair-use (fair dealing) analysis to determine if permission is required to use a given source. Consider whether the material lies in the public domain, is open access, or if others hold the copyright. The transformative factor (i.e., whether you have added enough insights to the original work) and the amount of the work that you plan to include (less than 10% of the work, one book chapter, one periodical article, and/or one newspaper article are often considered fair use) also feed into this fair-use analysis. Look at your institution's policies regarding copyright and fair use. University Libraries can often help with this assessment and may also help you obtain permission. Here are some primers on open access, fair use, and the public domain: https://fairuse.stanford.edu, especially its sections on Fair Use and the Public Domain; https://www.carl-abrc.ca/advancing-research/scholarly-communication/open-access/?cn-reloaded=1). Useful textbooks include the New Media guide and the Canadian Copyright: A Citizen's Guide.

Your course design is your intellectual property. Most instructors assume they have control over their own behavior courses, as they created it, and creators of a document are normally the first copyright holder. However, this right may be transferred to someone else. For example, in many jurisdictions, there is a rule under copyright law that work "made for hire" is actually owned by the employer, unless there is an agreement to the contrary. It is important, therefore, to find answers to the following

questions. Do you maintain the intellectual property rights once your course is posted to the LMS? If you don't, and you deliver your course asynchronously, can your institution re-use your course materials without you? Can they sell your course materials to other institutions, without your permission or knowledge? Understanding the rules governing online teaching at your institution may influence the approach you adopt in course design.

Administrators regularly announce the benefits of online courses; however, some faculty may worry that we could be painting ourselves into a corner, with online courses becoming the only option. While online teaching has numerous benefits, none of us want face-to-face teaching to disappear. Moreover, as we hope has been made clear here, the materials you develop for your course are tools, not teaching; even the best-designed asynchronous online course cannot simply be "plugged in" to play without the instructor. Ensuring administrators understand the importance of good teaching regardless of medium is a long-term goal for us all.

Learning by Teaching

All teaching is a work-in-progress; while online teaching may not be your first choice, remember: a growth mindset benefits us and our students alike. Your course is unlikely to be (and importantly, doesn't need to be) perfect on the first day of the class. As we tell our students, you will learn by doing. Be comfortable with that, and make space for your learning as the term progresses. Ask your students for anonymous feedback and be sure to discuss how you are responding to their comments. Take advantage of peer teaching expertise both at your institution, and via the professional networks that have

emerged (see Faculty Recommendations, above). Keep track of common questions that arise on assignments and problems that you discover in the course structure so that you can improve in later classes; a journal of your thoughts and ideas across the term can be quite useful. While we all hope for a return to face-to-face teaching soon, planning for more than one term in which a significant component of coursework is online is probably wise.

Even if you are confident that your future will not include any more online-only classes, your efforts now can improve and expand your pedagogy. You may find, for example, that you prefer the approaches to assignment and/or assessment structure developed for online classes, and decide to apply them to your face-to-face classes. If you've wanted to experiment with "flipped" class formats, you will find such approaches easier to implement after developing resources for online-only classes. Be open to the possibilities, and look for these opportunities. Include your students in this process. We will learn the way forward together.

About the Authors

We are a group of faculty with over 100 years of combined experience teaching animal behavior and behavioral ecology courses at the college level. Our experience spans public and private universities, primarily undergraduate institutions and research intensive institutions with extensive graduate programs. Our class sizes range from 10 to 120 students, and all but one of us teach courses with a lab component (8 to 24 students per lab section). Our experience teaching online varies, with two having extensive experience and the majority having only begun teaching in this modality since

March 2020, in response to the novel coronavirus (Covid-19) pandemic. We are all dedicated behavior teachers concerned with how to best educate our students using online formats while also balancing our pedagogical goals and personal workload, in full consideration of students' varied backgrounds, challenges, and access to technology.

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