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PERSPECTIVE AND REVIEW

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Using remote seminars to teach animal behavior

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Abstract

In response to the COVID-19 crisis, numerous academic conferences and seminars were moved online. Some remote (online) seminars have the aim to be maintained permanently after the pandemic, offering weekly opportunities for scientists, postdocs, and students to learn about research and to improve global networking. Remote seminars are a good option to promote inclusion and diversity, allowing students worldwide to participate and to interact with researchers from a broad cultural and ethnic background. Capitalizing on our experience with the ongoing International Remote Seminar on Frontiers in Social Evolution (FINE), we propose four teaching tools that can be integrated into undergraduate and graduate courses and that can be adapted for use with most remote seminar series. We make recommendations for the use of: (i) Certified remote seminar attendance. (ii) Relevant articles from the primary literature. (iii) Teaching slides, and (iv) Recorded seminars. Our aims are to promote and facilitate the use of the proposed teaching tools in Animal Behavior and related courses, and to encourage other remote seminar organizers to make teaching tools available.

KEYWORDS
animal behavior, COVID-19, education, Frontiers in Social Evolution, lecturer, remote seminar, teaching

1 | INTRODUCTION

The abrupt transition to remote learning necessitated by the COVID-19 crisis has created numerous challenges for university lecturers (see Glossary; Bao, 2020; Barton, 2020; Elsalem et al., 2021; Hughes et al., 2021). At the same time, this transition has produced new and creative educational opportunities, many of which are just beginning to be realized. At a first step, numerous departmental seminar series had been shifted to remote platforms. Notably, increased use of digital platforms to convene research seminars in a wide range of disciplines has revealed the ease with which large, international communities of colleagues can be brought together to share information and resources that readily lend themselves to use in instructional contexts (Botchkarev, 2020; Bottanelli et al., 2020; Wood & Duchesneau, 2021; Zipple & Lange, 2021; Table 1). Such remote (online) seminars create important opportunities for students to explore established and emerging research in a dynamic, discovery-based format that can be tailored to fit a diverse array of instructional levels, learning objectives, and institutional settings. Ease of international participation by both presenters and audience members promotes diversity in research and reduces barriers to access while facilitating new educational and research collaborations.

Here, we illustrate how remote seminars can be used in teaching of animal behavior. Our aims are to (i) demonstrate what teaching tools derived from remote seminars are already available to lecturers in animal behavior and (ii) inform organizers of remote seminars what teaching tools they can make available to lecturers. As an example, we describe a series of teaching activities that we have developed in concert with the International Remote Seminar on Frontiers in Social Evolution (FINE), which began in Sep. 2020 (Wood & Duchesneau, 2021). Originally conceived as a forum for sharing research, it quickly became apparent that the FINE and other remote seminars offer critical learning opportunities for students. To capitalize on these opportunities and to share these resources more broadly, we outline multiple ways in which students can engage with remote seminars to increase understanding of key behavioral concepts, improve skills associated with critical evaluation of behavioral research, and promote clear written and verbal communication regarding primary research findings. For this—as for any teaching effort—it is important to first define learning outcomes, describe the proposed tools, and illustrate how these tools can be integrated into the classroom. As terminology in higher education differs among countries and institutions, we provide a glossary of the terms we use (Glossary).

2 | LEARNING OUTCOMES

Students at all levels may benefit from remote seminars in three domains of cognitive (learning–knowledge), psychomotor (skills), and affective (attitudes and values) learning (sensu Bloom et al., 1956). The level at which the suggested teaching activities may be used to facilitate these learning outcomes should be contingent upon students' prior knowledge and the goals and scope of the learning experience (Cannon & Feinstein, 2005).

2.1 | Knowledge

This domain considers the question "What do we want students to know?" It encompasses facts, terminology, principles, models, and theories (Vaughan, 1980). Remote seminars and their associated teaching tools may contribute to these various areas of knowledge. For example, several remote seminars (Table 1) addressed concepts in animal behavior, ecology, and evolution, as well as the process of doing science using natural history observations, experimental manipulations in the field or laboratory, comparative approaches, and analytic models or simulations. Remote seminars offer students access to more international knowledge from primary sources (i.e., scientists and their students), instead of getting this knowledge via secondary or tertiary resources, such as textbooks. Depending on course-specific goals, lecturers could emphasize these topics in lectures and inquiry-based activities (e.g., laboratory experiments), as well as engage students in discussion about these topics.

TABLE 1 Examples of remote seminar series and other video channels related to studies in animal behavior that emerged during the COVID-19 pandemic

Full name	Platforms	First seminar	Continuation
Evolution & Ecology Seminars (EvoEcoSeminars)	YouTube/Slack	15 Apr. 2020	At least until 2021
Long-Term Animal Research Seminar Series	YouTube	12 May 2020	Ongoing
International Remote Seminar on Frontiers in Social Evolution (FINE)	Zoom/YouTube	1 Sep. 2020	Ongoing
Virtual Seminar on the Economics of Risky Health Behaviors (VERB)	Unknown (not all seminars are recorded)	Sep. 2020	Ongoing
Animal Behavior Society	YouTube	8 Oct. 2020	Ongoing
World Wide Neuro	Unknown	Unknown	Ongoing

Note: Series are listed in the order of the launching of its first seminar.

2.2 | Skills

This domain addresses the question "What do we want students to be able to do?" It encompasses techniques for critical thinking, problem-solving, and communication (Conklin, 2005). Remote seminars give students the opportunity to observe a range of scientific methodologies in action and to identify the questions, hypotheses, and experimental design used by the presenter, as well as to practice interpreting graphs and tables. In lectures, students can be directed to work in teams to evaluate the science being presented and perhaps propose alternative hypotheses or experimental designs. By participating in a discussion period with an invited speaker, students can develop skills for formulating and asking questions and learn about the skills (including personal and administrative) the researcher needed to establish and maintain the project. Additional activities may require students to communicate with each other, or to prepare a presentation based on a given teaching tool, which would further enhance development of communication skills.

2.3 | Attitude

This domain is concerned with affective learning, namely how to enrich student attitudes and values, in this case toward science. In the context of remote seminar tools, this domain addresses the questions: "What do we, as researchers, want students to think or care about?" and "How do we as researchers engage students in developing their own attitudes and values as future professionals?" It includes developing awareness of ethics, morals, and the practice of these values in one's professional and everyday life (MacLean & Cahillane, 2015). Remote seminars provide examples of real-world scientists communicating research about which they are passionate. These seminars should also inspire an appreciation for evidence-based arguments while illustrating the different ways that scientific problems can be approached (e.g., field and comparative research, modeling). Additionally, such seminars exemplify the importance of science communication, typically to peers, but may also inspire the need to communicate science to the general public. Finally, by involving international researchers of different backgrounds, accents, and experiences and showcasing research done around the world, remote seminars promote diversity, stimulate discussion on the ethics of working in different countries, and highlight the scientific and cultural advantages of building teams of collaborators with diverse backgrounds.

2.4 | Networking

In addition to the core learning domains, using teaching tools derived from remote seminars in the classroom (for details see below) will allow students to expand on other professional skills that will aid their career advancement (Turnbull & Gotian, 2020). Remote seminars provide a safe environment where students at different levels, especially those in early career stages, can build their confidence by participating in discussions and interactions with peers and near-peers (e.g., group discussions involving undergraduate and graduate students). Further, attending live seminars gives students networking opportunities, particularly when engaging in the discussion with speakers. Such discussions allow students to practice two important skills needed to develop and maintain a professional network: how to be an active listener and how to ask questions. Mastering these skills provides the foundation for honest and enduring interactions with colleagues that can result in productive collaborative relationships.

3 | TEACHING TOOLS EMERGING FROM REMOTE SEMINARS

Here, we describe how remote seminars can be used for teaching and how teaching tools similar to those produced by FINE can be used to enhance student learning experiences (Table 2). Details of tools developed by the FINE community are described in Box 1.

3.1 | Remote seminar attendance

Historically, many universities have treated participation in seminars or conferences similarly to enrolling in a course. For example, Ph.D. students in many countries have to obtain credit points during their studies; participating in a seminar can contribute to this. However, it may be difficult for students to prove that they have participated in a remote seminar. Organizers of remote seminars can provide certificates of attendance if they can verify that students participated. This is time-consuming for seminars with large audiences and can be challenging for the seminar organizer while hosting a speaker and ensuring that the seminar progresses without technological issues or interruptions. Another option for verifying participation is to ask students to submit written summaries of presentation within 24 h of a seminar (Appendix S1). Submitted summaries will provide university officials information they can use to decide how many credit points can be given. This tool could be further developed by local lecturers who could then give more credit to students. For example, lecturers could give their students detailed instructions on what kind of syntheses they have to submit after each seminar to qualify for study credit points.

3.2 | Relevant articles

Reading and discussing the primary literature can have numerous intellectual and personal benefits for students (Kozeracki et al., 2006). Reading articles related to a seminar prior to viewing the presentation can improve general understanding of a speaker's

TABLE 2 Different teaching tools and how remote seminar organizers can make them available for lecturers, who then develop different teaching activities.

Teaching tool	Action by organizer of remote seminar	Examples of teaching activity by lecturer	How to access the tool
Online seminar attendance	Provide certificate of participation upon request and attendance	Students sign up and participate in remote seminar, receive credit.	Appendix S1
Relevant articles	Request that presenters provide bibliographical information for 2–3 relevant articles	Students read and discuss articles, write summaries	Available for free download on homepage[a]
Teaching slides	Request that presenters make important slides available	Include in lecture; provide online and ask for summary	Available for free download on homepage[a] and ResearchGate[b]
Recorded seminar	Store recorded seminar on a video platform	Summaries, discussion, essay, invite speaker. Creation of scientific communication material	YouTube page of FINE[c]

[a]https://www.socialevolutionseminar.com/portfolio-3/project-two-f6cnw.

[b]https://www.researchgate.net/project/FINE-Teaching-Slides-for-Social-Evolution.

[c]https://www.youtube.com/channel/UCIXFO1pLpCTBy7vSwLWH-GA.

research theme, reducing energy spent during the seminar to understand basic terms and concepts while helping to generate more informed questions. These benefits are amplified when members of research groups or journal clubs discuss recommended readings together, prior to, or after seminars (Glazer, 2000); this can be particularly beneficial when reading groups consist of individuals from research groups from around the world. Remote seminar organizers can facilitate these activities by asking speakers to provide bibliographical information for several relevant articles and making this information available to seminar participants before the seminar, such that students and lecturers can prepare themselves.

3.3 | Teaching slides

Presentations in seminars, including those online, are typically 45–60 min long, which limits their use in the classroom. Furthermore, extracting the take home messages from long seminars may require considerable effort by the lecturer. To facilitate the use of remote seminar presentations in the classroom, presenters can prepare sets of teaching slides that are made available to the scientific community. Such teaching slides will contribute to disseminating the work of presenters to future generations of scientists. Presenters could be encouraged to record themselves explaining the content of the slides. Together with a photograph of the researcher on the title slide, this brings the international expert directly into the classroom, making it a more personalized experience for students. The audio portion can be muted, or deleted, from the presentation if the lecturer prefers. Providing students access to slides and audio recordings will increase accessibility to students with limited ability to attend seminars and promote the review of relevant course information outside of class. Providing captions improves accessibility to students with hearing impairments or other challenges to auditory processing of information.

3.4 | Recorded seminars

It is common practice that remote seminars are recorded and stored on video platforms (Zipple & Lange, 2021). This enables lecturers to show seminars (or parts of them) during diverse class times, or to require viewing them as an assignment to be completed at home. Several teaching activities can then be associated with these recorded seminars, including student discussions, written summaries, and development of new activities (e.g., grant proposals and interviews with speakers). Numerous seminars are livestreamed and freely accessible on specific YouTube channels (Table 1) and other video platforms (Bottanelli et al., 2020).

Recorded seminars can be used to generate student-led discussions during lecture periods. Lecturers can invite remote seminar speakers to join the discussion after students have watched the seminar. Students can prepare for a discussion with the remote seminar speaker by writing a summary and preparing a few questions about a related article. They can ask the speaker questions about the seminar, the speaker's career path, and related academic issues. The benefits are numerous; students improve their understanding of research, learn how to interact with international scientists, build confidence, and develop networking skills (Box 2).

4 | SCIENCE COMMUNICATION

The COVID-19 pandemic has highlighted the well-known importance of science communication skills (Kelp & Hubbard, 2021), thereby underscoring calls to integrate science communication more fundamentally into science education and training (Dahm et al., 2019). Various universities either encourage or require students to gain work-based experience in communicating scientific ideas. For example, the University of Derby, UK, runs a final year undergraduate module taken by students in programs ranging from Biology and Zoology to Human Biology and Forensic Sciences. As part of

BOX 1 FINE teaching tools

Teaching slides: FINE presenters are invited to submit up to two sets of teaching slides, each consisting of a title slide, three slides with results and figures, and a conclusion slide (Appendix S2 for instructions to FINE presenters). These slides are most often created in Powerpoint which allows the lecturers to modify them to their specific teaching needs. While the level of complexity of slides is determined by the FINE presenter, lecturers can still adjust them for teaching students of different levels. FINE presenters are encouraged to record themselves explaining the content of the slides.

FINE teaching slides are available for free download on the FINE homepage https://www.socialevolutionseminar.com/portfolio-3/project-three-w79m7 and sometimes on the homepages of the individual presenters. Additionally, many FINE teaching slides are available on ResearchGate and can be accessed from the project "FINE teaching slides for social evolution" (https://www.researchgate.net/project/FINE-Teaching-Slides-for-Social-Evolution). By following this project, lecturers will be notified when new slides become available.

Relevant articles: The FINE organizers request that speakers provide a summary and bibliographical information for three articles related to their seminar. This reading list is then sent to the FINE community before the seminar and is made available to the general public on the FINE homepage (https://www.socialevolutionseminar.com/portfolio-3/project-two-f6cnw).

Remote seminar attendance: To get a certificate of attendance, the requirement for students is to submit a minimum of three key points from each talk in a written summary (PDF). Interestingly, students typically submitted much longer and more detailed summaries, indicating their commitment and learning achievements. To verify attendance, organizers did not mark the summaries but only registered their submission.

Recorded seminars: Multiple authors of this paper have already invited FINE speakers to engage with students taking their undergraduate behavior courses (detailed example in Box 2).

BOX 2 Using FINE teaching tools in a behavioral ecology course

In 2021, the lead author (Hayes) used the FINE seminar to promote inquiry-based learning and discussion by 3rd and 4th year undergraduate and Master's students who were taking his remote, behavioral ecology course. During the academic term, the students engaged with ten recorded FINE seminars on the FINE YouTube page. Student engagement involved multiple steps (Figure 1). First, the students wrote 200-word summaries and three questions (emphasizing Tinbergen's 4 questions; Tinbergen, 1963) about an article provided by the FINE speaker in a journal. Students then watched a recorded seminar together during the first hour of a 3-h class session. Next, the students discussed the seminar topic. For eight out of ten lectures, the speaker joined the discussion via zoom for 45–60 min, answering questions about the science and process, as well as their career path. This activity not only promoted inquiry-based learning, but also developed student confidence and ability to interact with leading scientists. To facilitate an inclusive discussion, Hayes moderated the session, calling on students who had a question. If speakers did not join the discussion (two of the 10 lectures), students watched 15–20 min of the recorded discussion among FINE participants following the seminar, after which they engaged in discussion with Hayes. After watching the seminar, the students added two layers to their summaries—(i) 2–3 themes of the seminar, written for a non-scientist and (ii) final thoughts and outstanding questions. Altogether, the summaries for each FINE seminar were one page in length, requiring that students write succinctly. At the end of the academic term, the students wrote a synopsis of the FINE seminars, an activity that emphasized students' abilities to synthesize information. Instructions to students taking Hayes' course are posted at the FINE website (https://www.socialevolutionseminar.com/portfolio-3/project-four-2lsaj).

Student feedback played an important role in the process. In response to verbal student feedback, Hayes changed the organization of the 3-h session. Subsequently, students first discussed a relevant article, preparing them for the seminar. The students then watched the seminar after which they engaged in discussion with the speaker or Hayes. We encourage such flexibility; responding to student suggestions improved the learning process in this class.

the course, students have to create a ~3-min public-facing video. Students choose the topic, as well as the target audience. Similar assignments could be included in a variety of undergraduate and graduate animal behavior courses. For example, engaging deeply with the content of a seminar will increase understanding of principles of behavioral ecology. This yields clear benefits to not only the recipients but also the creators of science communications or outreach activities (Clark et al., 2016). Organizers of remote seminars could publish high-quality videos of this type on their homepages and YouTube channels (for an example see https://www.youtube.com/watch?v=iKKHQwT-cuQ). The prospect of creating a video that will be publicly available and have the "stamp of approval" of established scientists could act as a powerful incentive to produce coursework of the highest standard.

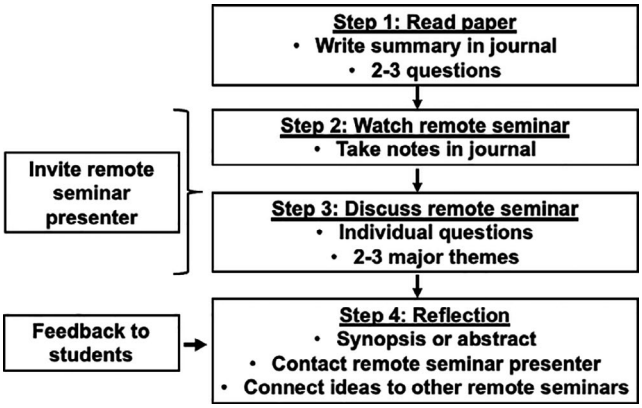

FIGURE 1 Flow of activities used in Hayes' Behavioral Ecology course for 3rd- and 4th- year undergraduates and Masters' students

5 | ACCESSIBILITY AND DIVERSITY

The expansion of remote seminars and other remote means of scientific discussion (e.g., virtual conferences) during the COVID-19 pandemic has increased accessibility of research to students and lecturers from around the world (Estien et al., 2021; Skiles et al., 2020). Accordingly, remote seminars reach a diverse audience and have the potential to improve the diversity of the animal behavior community (Hughes et al., 2021; Lee, 2020; Tang-Martínez, 2020). For example, the FINE community consists of >300 individuals, including students and lecturers at various career stages, from >25 countries spread over 5 continents. The FINE organizers have shared teaching tools with their community (Box 1). To capitalize upon this diversity, organizers of all remote seminars should share teaching tools with their community.

Organizers of remote seminar series can also take additional steps to increase accessibility and diversity. Advertising remote seminars across multiple platforms, including email distribution lists and various forms of social media, will reach a diverse audience. Using multiple forms of livestreaming (e.g., FINE seminar is livestreamed on Zoom and YouTube) makes the seminars accessible to a broad audience, including students and lecturers with conflicting schedules and non-scientists, alike. Recording the seminars to freely accessible video platforms increases access to students and lecturers with restrictions (e.g., limited computer access and some learning disabilities). Finally, organizers of remote seminar series should invite speakers from institutions that serve individuals from members of under-represented minority groups.

6 | RECOMMENDATIONS

6.1 | Use remote seminars and teaching tools in lectures

A key feature of many remote seminars is that they can be adapted to suit the needs of a wide range of courses, ranging from introductory to advanced undergraduate and graduate classes. This is true for many different countries (Table S1). Lecturers can choose teaching tools and teaching activities based on numerous factors including specific course learning outcomes, method of lecture (e.g., in-person, asynchronous, or synchronous online), class size, course level (e.g., undergraduate and graduate), format (e.g., lecture, discussion), and students' access to resources. As such, remote seminars offer quality and flexibility for learning in a changing world. For example, students in introductory courses can be introduced to key concepts and hypotheses using teaching slides provided by remote seminar speakers. These activities can be followed by class discussion or preparation of written summaries of key points. Students in upper-level courses (see Box 2 for a detailed example the implementation of FINE teaching tools) can explore topics in greater depth by watching an entire remote seminar. Associated activities can include visiting a speaker's website, writing grant proposals, or summarizing additional papers by the speaker. We encourage lecturers to create the combination of activities that best suits their goals, including developing exercises of their own that stem from remote seminar presentations.

6.2 | Use remote seminars in institutional seminar series

At institutions around the world, in-person seminar series have been used as an instrument to disseminate scientific advances. However, prohibitive travel costs and lack of funds limit the ability of many institutions to host national and international seminar speakers. Remote seminars offer a cost-effective (and environmentally friendly) way to diversify seminar series and opportunities. Incorporating remote seminars into institutional seminar series would benefit students and lecturers at the host institution, as well as speakers who are unable to travel for personal, financial, and professional reasons.

6.3 | Use remote seminars to promote international collaborations

Remote seminars can connect students and lecturers across states (or provinces) and countries, promoting national and international lecturer–student and student–student networks. For example, lecturers can facilitate journal clubs involving multiple research groups, members of which discuss the relevant articles prior to watching remote seminars. These joint journal clubs could be informal, or part of formal student training programs, such as those that support international student research (e.g., U.S. National Science Foundation International Research Experiences for Students). As is the case for FINE, organizers of remote seminar series could arrange virtual, individual meetings with speakers and members of their research groups before and after seminars. Likewise, we recommend that organizers of remote seminar series allow time for extended discussion immediately following the seminar. Our experience is that these extended discussions allow a diversity of attendees—including students—to

participate while providing important feedback to speakers. Finally, we encourage lecturers to work with their respective universities to encourage cross-listed courses that allow students from multiple institutions to engage in remote seminars. Ultimately, these ways of connecting students and lecturers could promote international collaboration and provide novel ways of teaching and informing animal behavior research.

7 | CONCLUSIONS

Remote seminars give international lecturers and students free access to leading scientists in their discipline. When these seminars are stored on video platforms, this resource is available indefinitely. Students that previously had limited, or no access, to international conferences can now have weekly access to international experts. Using remote seminars in teaching can be beneficial to students, particularly when presenters join discussions. Such interactions can humanize scientists, broadening the impact of their science and increasing student interest in scientific endeavors and careers. Given their educational value, we think it will be beneficial if such collaborative international remote seminars persist after most universities return to live instruction of students. We encourage organizers and lecturers to think creatively as to how to incorporate remote seminars in classes, discussion groups, and university seminar series. Doing so will increase access of cutting-edge science and researchers to a wide audience and promote a broader participation in scientific endeavor.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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