



HAL
open science

Using remote seminars to teach animal behavior

Loren Hayes, Leticia Aviles, Eduardo Fernandez-duque, Maren Huck, Eileen Lacey,
Adriana Maldonado-chaparro, Miles Matchinske, Neville Pillay, Nancy Solomon,
Carsten Schradin

► To cite this version:

Loren Hayes, Leticia Aviles, Eduardo Fernandez-duque, Maren Huck, Eileen Lacey, et al.. Using remote seminars to teach animal behavior. *Ethology*, 2021, <10.1111/eth.13219>. <hal-03331829>

HAL Id: hal-03331829

<https://hal.science/hal-03331829v1>

Submitted on 2 Sep 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

1 PERSPECTIVES AND CURRENT DEBATES

2
3 Published as

4 **Hayes, L. D., Aviles, L., Fernandez-Duque, E., Huck, M., Lacey, E. A., Maldonado-Chaparro, A., Matchinske, M.,**
5 **Pillay, N., Solomon, N. G. & Schradin, C.** Using remote seminars to teach animal behavior. *Ethology*, n/a.
6 <http://doi.org/10.1111/eth.13219>

7
8
9 **Using remote seminars to teach animal behavior**

10
11 Loren D. Hayes¹, Leticia Aviles², Eduardo Fernandez-Duque³, Maren Huck⁴, Eileen A. Lacey⁵,
12 Adriana Maldonado-Chaparro⁶, Miles Matchinske¹, Neville Pillay⁷, Nancy G. Solomon⁸, &
13 Carsten Schradin^{7,9}

14
15 **Short title: Remote seminars and teaching**

16
17 1 Department of Biology, Geology, and Environmental Science, University of Tennessee at
18 Chattanooga, TN USA

19 2 Department of Zoology and Biodiversity Research Centre, University of British Columbia,
20 Vancouver, Canada

21 3 Department of Anthropology and School of the Environment, Yale University, USA

22 4 College of Science and Engineering and Environmental Sustainability Research Centre,
23 University of Derby, U.K.

24 5 Museum of Vertebrate Zoology and Department of Integrative Biology, University of
25 California, Berkeley, CA USA

26 6 Department of Biology, Faculty of Natural Sciences, Universidad del Rosario, Bogotá,
27 Colombia

28 7 School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, South
29 Africa.

30 8 Department of Biology, Miami University, Oxford, Ohio, USA

31 9 Université de Strasbourg, CNRS, IPHC UMR 7178, F-67000 Strasbourg, France

32
33
34
35 **Correspondence**

36 Loren D. Hayes, Department of Biology, Geology, and Environmental Science, University of
37 Tennessee at Chattanooga, USA. Email: loren-hayes@utc.edu

38
39 Carsten Schradin, Institut Pluridisciplinaire Hubert Curien, Département d'Ecologie, Physiologie
40 et Ethologie, 23, rue Becquerel, 67087 Strasbourg cedex 2,
41 France. carsten.schradin@iphc.cnrs.fr

42
43 **Acknowledgments**

44
45 We are grateful to all FINE presenters and to the audience of FINE for lively discussions and
46 important academic interactions. We thank two anonymous reviewers for helpful feedback.

49 **Abstract**

50

51 In response to the COVID-19 crisis, numerous academic conferences and seminars were moved
52 online. Some remote (online) seminars have the aim to be maintained permanently after the
53 pandemic, offering weekly opportunities for scientists, postdocs, and students to learn about
54 research and to improve global networking. Remote seminars are a good option to promote
55 inclusion and diversity, allowing students worldwide to participate and to interact with
56 researchers from a broad cultural and ethnic background. Capitalizing on our experience with the
57 ongoing International Remote Seminar on Frontiers in Social Evolution (FINE), we propose four
58 teaching tools that can be integrated into undergraduate and graduate courses and that can be
59 adapted for use with most remote seminar series. We make recommendations for the use of: 1.
60 Certified remote seminar attendance. 2. Relevant articles from the primary literature. 3. Teaching
61 slides, and 4. Recorded seminars. Our aims are to promote and facilitate the use of the proposed
62 teaching tools in Animal Behavior and related courses, and to encourage other remote seminar
63 organizers to make teaching tools available.

64

65 **Keywords:** FINE, education, remote seminar, animal behavior, COVID-19, teaching, lecturer

66

GLOSSARY

Credit: Students accumulate “study credits” to finish their studies, or to be allowed to participate in exams. For example, European Credit Transfer (ECTs) and Accumulation System credits, where 1 ECT corresponds to 25-30 hours of work.

Diversity: Students and lecturers of different backgrounds, including but not limited to differences in age, gender, sexual orientation, race, ethnicity, culture, religion, geography, disability, socioeconomic status, area of expertise, level of experience, thinking style, native language, or skill set (*sensu* Swartz et al. 2019).

FINE: International Remote Seminar on Frontiers in Social Evolution. A remote seminar that offers live participation in talks of 45 minutes followed by 60 minutes of discussion. Talks occur via Zoom and YouTube and are stored on YouTube where they are available for later viewing and re-viewing: <https://www.youtube.com/channel/UCIXFO1pLpCTBy7vSwLWH-GA>

Learning: The acquisition of new understanding, knowledge, skills or attitudes. Learning can be enhanced and facilitated by the teaching approach and philosophy of lecturers.

Lecture: Any activity where teaching is done by lecturers, including modules, classes, labs, and practica.

Lecturer: Anybody who teaches, including but not restricted to teachers, instructors, and professors.

Program: A set of educational activities that lead to an academic degree, e.g., bachelors, honors, masters, doctorate.

Remote Seminar: A seminar that is held on any video communication platform. It refers primarily to seminars which store the presented talks permanently on video platforms, making them available for later viewing and re-viewing.

Student: A person enrolled at a university to obtain a degree, including Ph.D. students.

Teaching: Any instructional effort, including 'front-of-class' teaching (whether remote or live on campus) and more interactive formats (seminars, workshops, labs), as well as student-led, self-directed approaches where the lecturer only acts as a guide or facilitator

Teaching activity: Any action by students that facilitates learning, e.g., reading, discussing, note taking, writing a summary or essay, interviewing a scientist.

Teaching tool: A resource (here derived from remote seminars) that can be used by lecturers to develop specific teaching activities. Examples include stored videos or already prepared instructional slides.

University: Any institution of higher education.

67

68

69 1 INTRODUCTION

70

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

86

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

103

104 2 LEARNING OUTCOMES

105

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

111

112 2.1 Knowledge

113

114 This domain considers the question “*What do we want students to know?*”. It encompasses facts,
115 terminology, principles, models, and theories (Vaughan 1980). Remote seminars and their
116 associated teaching tools may contribute to these various areas of knowledge. For example,
117 several remote seminars (Table 1) addressed concepts in animal behavior, ecology and evolution,
118 as well as the process of doing science using natural history observations, experimental
119 manipulations in the field or laboratory, comparative approaches, and analytic models or
120 simulations. Remote seminars offer students access to more international knowledge from
121 primary sources (i.e., scientists and their students), instead of getting this knowledge via
122 secondary or tertiary resources, such as textbooks. Depending on course-specific goals, lecturers
123 could emphasize these topics in lectures and inquiry-based activities (e.g., laboratory
124 experiments), as well as engage students in discussion about these topics.
125

126

127 **2.2 Skills**

128

129 This domain addresses the question “*What do we want students to be able to do?*”. It
130 encompasses techniques for critical thinking, problem solving, and communication (Conklin
131 2005). Remote seminars give students the opportunity to observe a range of scientific
132 methodologies in action and to identify the questions, hypotheses and experimental design used
133 by the presenter, as well as to practice interpreting graphs and tables. In lectures, students can be
134 directed to work in teams to evaluate the science being presented and perhaps propose alternative
135 hypotheses or experimental designs. By participating in a discussion period with an invited
136 speaker, students can develop skills for formulating and asking questions and learn about the
137 skills (including personal and administrative) the researcher needed to establish and maintain the
138 project. Additional activities may require students to communicate with each other, or to prepare
139 a presentation based on a given teaching tool, which would further enhance development of
140 communication skills.

141

142 **2.3 Attitude**

143

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

160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205

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 hours of a seminar (Supplementary Material 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 (Kozieracki et al. 2006). Reading articles related to a seminar prior to viewing the presentation can improve general understanding of a speaker's 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

206 (Glazer 2000); this can be particularly beneficial when reading groups consist of individuals
207 from research groups from around the world. Remote seminar organizers can facilitate these
208 activities by asking speakers to provide bibliographical information for several relevant articles
209 and making this information available to seminar participants before the seminar, such that
210 students and lecturers can prepare themselves.

211

212 **3.3 Teaching slides**

213

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

227

228 **3.4 Recorded seminars**

229

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

237

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

245

246 **4 SCIENCE COMMUNICATION**

247

248 The COVID-19 pandemic has highlighted the well-known importance of science communication
249 skills (Kelp & Hubbard, 2021), thereby underscoring calls to integrate science communication
250 more fundamentally into science education and training (Dahm et al., 2019). Various universities
251 either encourage or require students to gain work-based experience in communicating scientific

252 ideas. For example, the University of Derby, UK, runs a final year undergraduate module taken
 253 by students in programs ranging from Biology and Zoology to Human Biology and Forensic
 254 Sciences. As part of the course, students have to create a ~ 3 minute public facing video.
 255 Students choose the topic, as well as the target audience. Similar assignments could be included
 256 in a variety of undergraduate and graduate animal behavior courses. For example, engaging
 257 deeply with the content of a seminar will increase understanding of principles of behavioral
 258 ecology. This yields clear benefits to not only the recipients but also the creators of science
 259 communications or outreach activities (Clark et al., 2016). Organizers of remote seminars could
 260 publish high quality videos of this type on their homepages and YouTube channels (for an
 261 example see <https://www.youtube.com/watch?v=iKKHQwT-cuQ>). The prospect of creating a
 262 video that will be publicly available and have the "stamp of approval" of established scientists
 263 could act as a powerful incentive to produce coursework of the highest standard.

264

265 **5 ACCESSIBILITY & DIVERSITY**

266

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

276

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

286

287 **6 RECOMMENDATIONS**

288

289 *(1) Use remote seminars and teaching tools in lectures.* A key feature of many remote seminars
 290 is that they can be adapted to suit the needs of a wide range of courses, ranging from
 291 introductory to advanced undergraduate and graduate classes. This is true for many different
 292 countries (Supplementary Material S3). Lecturers can choose teaching tools and teaching
 293 activities based on numerous factors including specific course learning outcomes, method of
 294 lecture (e.g., in person, asynchronous or synchronous online), class size, course level (e.g.,
 295 undergraduate, graduate), format (e.g., lecture, discussion), and students' access to resources. As
 296 such, remote seminars offer quality and flexibility for learning in a changing world. For example,
 297 students in introductory courses can be introduced to key concepts and hypotheses using

298 teaching slides provided by remote seminar speakers. These activities can be followed by class
299 discussion or preparation of written summaries of key points. Students in upper-level courses
300 (see Box 2 for a detailed example the implementation of FINE teaching tools) can explore topics
301 in greater depth by watching an entire remote seminar. Associated activities can include visiting
302 a speaker's website, writing grant proposals, or summarizing additional papers by the speaker.
303 We encourage lecturers to create the combination of activities that best suits their goals,
304 including developing exercises of their own that stem from remote seminar presentations.
305

306 *(2) Use remote seminars in institutional seminar series.* At institutions around the world, in-
307 person seminar series have been used as an instrument to disseminate scientific advances.
308 However, prohibitive travel costs and lack of funds limit the ability of many institutions to host
309 national and international seminar speakers. Remote seminars offer a cost-effective (and
310 environmentally friendly) way to diversify seminar series and opportunities. Incorporating
311 remote seminars into institutional seminar series would benefit students and lecturers at the host
312 institution, as well as speakers who are unable to travel for personal, financial, and professional
313 reasons.
314

315 *(3) Use remote seminars to promote international collaborations.* Remote seminars can connect
316 students and lecturers across states (or provinces) and countries, promoting national and
317 international lecturer-student and student-student networks. For example, lecturers can facilitate
318 journal clubs involving multiple research groups, members of which discuss the relevant articles
319 prior to watching remote seminars. These joint journal clubs could be informal, or part of formal
320 student training programs, such as those that support international student research (e.g., U.S.
321 National Science Foundation International Research Experiences for Students). As is the case for
322 FINE, organizers of remote seminar series could arrange virtual, individual meetings with
323 speakers and members of their research groups before and after seminars. Likewise, we
324 recommend that organizers of remote seminar series allow time for extended discussion
325 immediately following the seminar. Our experience is that these extended discussions allow a
326 diversity of attendees – including students – to participate while providing important feedback to
327 speakers. Finally, we encourage lecturers to work with their respective universities to encourage
328 cross-listed courses that allow students from multiple institutions to engage in remote seminars.
329 Ultimately, these ways of connecting students and lecturers could promote international
330 collaboration and provide novel ways of teaching and informing animal behavior research.
331

332 **7 CONCLUSIONS**

333

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

344 so will increase access of cutting-edge science and researchers to a wide audience and promote a
 345 broader participation in scientific endeavor.

346

347 **ETHICAL STATEMENT**

348

349 Ethics approval was not required for this research.

350

351 **CONFLICT OF INTEREST**

352

353 The authors declare no conflict of interest.

354

355 **REFERENCES**

356

357 Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking
 358 University. *Human Behavior and Emerging Technologies*, 2, 113-115.

359 <https://publons.com/publon/10.1002/hbe2.191>

360

361 Barton, D. C. (2020). Impacts of the COVID-19 pandemic on field instruction and remote
 362 teaching alternatives: Results from a survey of instructors. *Ecology and Evolution*, 10, 12499-
 363 12507. <https://doi.org/10.1002/ece3.6628>

364

365 Bloom, B.S., Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). Taxonomy of
 366 Educational Objectives: The Classification of Educational Goals, Handbook 1: Cognitive
 367 Domain. New York: McKay.

368

369 Botchkarev, V. (2020, March 30). Online science seminars you can enjoy from home. Retrieved
 370 from <https://www.ascb.org/careers/online-science-seminars-you-can-enjoy-from-home/>

371

372 Bottanelli, F., Cadot, B., Campelo, F., Curran, S., Davidson, P.D., Dey, G., Raote, I., Straube, A.,
 373 & Swaffer, M.P. (2020). Science during lockdown – from virtual seminars to sustainable online
 374 communities. *Journal of Cell Science* 133 (15): jcs249607. <https://doi.org/10.1242/jcs.249607>

375

376 Cannon, H.M. & Feinstein, A.H. (2005). Bloom beyond Bloom: Using the revised taxonomy to
 377 develop experiential learning strategies. In: *Developments in Business Simulation and*
 378 *Experiential Learning: Proceedings of the Annual ABSEL conference 32, Orlando, FL.*

379

380 Clark, G., Russell, J., Enyeart, P., Gracia, B., Wessel, A., Jarmoskaite, I., . . . Roux, S. (2016).
 381 Science educational outreach programs that benefit students and scientists. *PLOS Biology*, 14

382 (2): e1002368. <https://doi.org/10.1371/journal.pbio.1002368>

383

384 Conklin, J., 2005. A taxonomy for learning, teaching, and assessing: A revision of Bloom's
 385 taxonomy of educational objectives complete edition (book review). *Educational Horizons* 83,
 386 154-159.

387

388 Dahm, R., Byrne, J., & Wride, M. A. (2019). Interdisciplinary communication needs to become a
 389 core scientific skill. *BioEssays*, 41(9): e1900101. <https://doi.org/10.1002/bies.201900101>

390

- 391 Elsalem, L., Al-Azzam, N., Jum'ah, A. A., & Obeidat, N. (2021). Remote E-exams during
392 Covid-19 pandemic: A cross-sectional study of students' preferences and academic dishonesty in
393 faculties of medical sciences. *Annals of Medicine and Surgery*, 62, 326-333.
394 <https://doi.org/10.1016/j.amsu.2021.01.054>
395
- 396 Estien, C. O., E. B. Myron, C. A. Oldfield, & A. Alwin; Ecological Society of America Student
397 Section. (2021) Virtual Scientific Conferences: Benefits and How to Support Underrepresented
398 Students. *Bulletin of the Ecological Society of America*, 102(2):e01859.
399 <https://doi.org/10.1002/bes2.1859>
400
- 401 Glazer, F.S. (2000) Journal clubs – a successful vehicle to science literacy. *J. Coll. Sci. Teach.*
402 24, 320-324.
403
- 404 Hughes, M., Bertram, S.M., Young, A.M., Merry, J.W., Kolluru, G.R., Dunlap, A.S., Danielson-
405 Francois, A., & Weiss, S. (2021). Teaching animal behavior online: A primer for the pandemic
406 and beyond. *Ethology*, 127, 14-21. <https://doi.org/10.1111/eth.13096>
407
- 408 Kelp, N. C., & Hubbard, B. (2021). Scaffolded curriculum for developing Science
409 Communication skills in Life Science undergraduates. *Journal of Microbiology & Biology*
410 *Education*, 22(1): ev22i21.2255. <https://doi.org/10.1128/jmbe.v22i1.2255>
411
- 412 Kozeracki, C. A., Carey, M. F., Colicelli, J., & Levis-Fitzgerald, M. (2006). An intensive
413 primary-literature-based teaching program directly benefits undergraduate science majors and
414 facilitates their transition to doctoral programs. *CBE—Life Sciences Education*, 5(4), 340-347.
415
- 416 Lee, D. N. (2020). Diversity and inclusion activism in animal behaviour and the ABS: A
417 historical view from the USA. *Animal Behaviour*.
418
- 419 MacLean, P. & Cahillane, M.A. The human factor in learning design, research, policy, and
420 practice. *International Journal of Information and Learning Technology*, Volume 32, Issue 3,
421 2015, pp. 182-196
422
- 423 Skiles, M., Yang, E., Reshef, O., Muñoz, D., Cintron, D., Lind, M. L., Rush, A., Armani, A.,
424 Faust, K. & Kumar, M. (2020). Beyond the carbon footprint: Virtual conferences increase
425 diversity, equity, and inclusion. DOI: <https://doi.org/10.21203/rs.3.rs-106316/v1>
426
- 427 Swartz, T. H., Palermo, A. G. S., Masur, S. K., & Aberg, J. A. (2019). The science and value of
428 diversity: closing the gaps in our understanding of inclusion and diversity. *The Journal of*
429 *Infectious Diseases*, 220(Supplement 2), S33-S41.
430
- 431 Tang-Martinez, Z. (2020). The history and impact of women in animal behaviour and the ABS: a
432 North American perspective. *Animal Behaviour*
433
- 434 Tinbergen, N. (1963). On aims and methods of ethology. *Zeitschrift für tierpsychologie*, 20, 410-
435 433.
436

- 437 Turnbull, Z. & Gotian, R. (2020, December 11). Five steps for networking during a pandemic.
438 Retrieved from <https://www.nature.com/articles/d41586-020-03567-9>
439
- 440 Vaughan, C.A. (1980). Identifying course goals: domains and levels of learning. *Teaching*
441 *Sociology*, 7, 265-279. <https://doi.org/10.2307/1317141>
442
- 443 Wood, D.B. & Duchesneau, A. (2021). Frontiers in Social Evolution (FINE) Remote Seminar,
444 Spring 2021 announcement. *Evolutionary Anthropology*, 30, 2-3. doi: 10.1002/evan.21880.
445
- 446 Zipple, M.N. & Lange, E.C. (2021). How long-term studies reveal otherwise unhidden
447 phenomena: The Long-term Research Seminar Series. *Evolutionary Anthropology*
448 <https://doi.org/10.1002/evan.21888>
449
450

451 **TABLE 1.** Examples of remote seminar series and other video channels related to studies in
 452 animal behavior that emerged during the COVID-19 pandemic. Series are listed in the order of
 453 the launching of its first seminar.
 454

Full name	Platforms	First seminar	Continuation
Evolution & Ecology Seminars (EvoEcoSeminars)	YouTube / Slack	15 April 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 September 2020	Ongoing
Virtual Seminar on the Economics of Risky Health Behaviors (VERB)	unknown (not all seminars are recorded)	September 2020	Ongoing
Animal Behavior Society	YouTube	8 October 2020	Ongoing
World Wide Neuro	unknown	unknown	Ongoing

455

456 **TABLE 2.** Different teaching tools and how remote seminar organizers can make them available
 457 for lecturers, who then develop different teaching activities.
 458

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.	Supplementary Material 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 ¹
Teaching slides	Request that presenters make important slides available.	Include in lecture; provide online and ask for summary.	Available for free download on homepage ¹ and ResearchGate ²
Recorded seminar	Store recorded seminar on a video platform.	Summaries, discussion, essay, invite speaker. Creation of scientific communication material.	YouTube page of FINE ³

459 ¹<https://www.socialevolutionseminar.com/portfolio-3/project-two-f6cnw>

460 ²<https://www.researchgate.net/project/FINE-Teaching-Slides-for-Social-Evolution>

461 ³ <https://www.youtube.com/channel/UCIXFO1pLpCTBy7vSwLWH-GA>

462

463

464

465
466
467**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 (Supplementary Material 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-two-f6cnw> 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 three-hour 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 minutes, 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 minutes 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 three-hour 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.

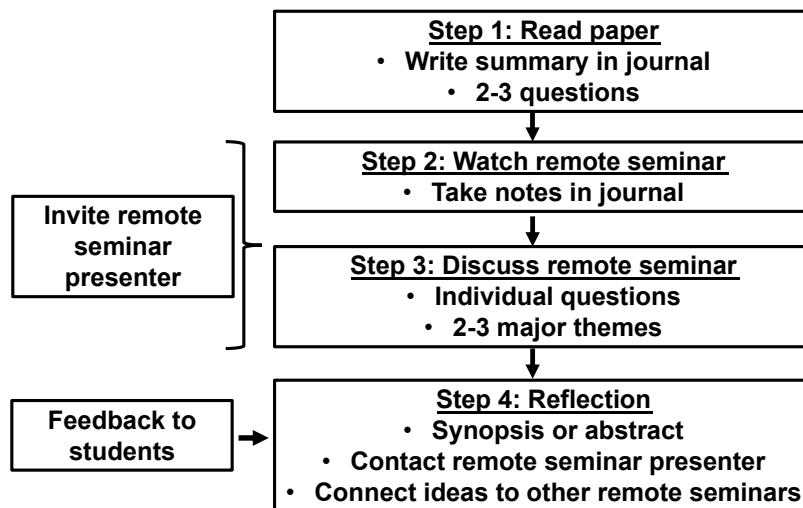


FIGURE 1. Flow of activities used in Hayes' Behavioral Ecology course for 3rd and 4th year undergraduates and Masters' students.

470 **TABLE 1.** Examples of remote seminar series and other video channels related to studies in
 471 animal behavior that emerged during the COVID-19 pandemic. Series are listed in the order of
 472 the launching of its first seminar.
 473

Full name	Platforms	First seminar	Continuation
Evolution & Ecology Seminars (EvoEcoSeminars)	YouTube / Slack	15 April 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 September 2020	Ongoing
Virtual Seminar on the Economics of Risky Health Behaviors (VERB)	unknown (not all seminars are recorded)	September 2020	Ongoing
Animal Behavior Society	YouTube	8 October 2020	Ongoing
World Wide Neuro	unknown	unknown	Ongoing

474

475 **TABLE 2.** Different teaching tools and how remote seminar organizers can make them available
 476 for lecturers, who then develop different teaching activities.
 477

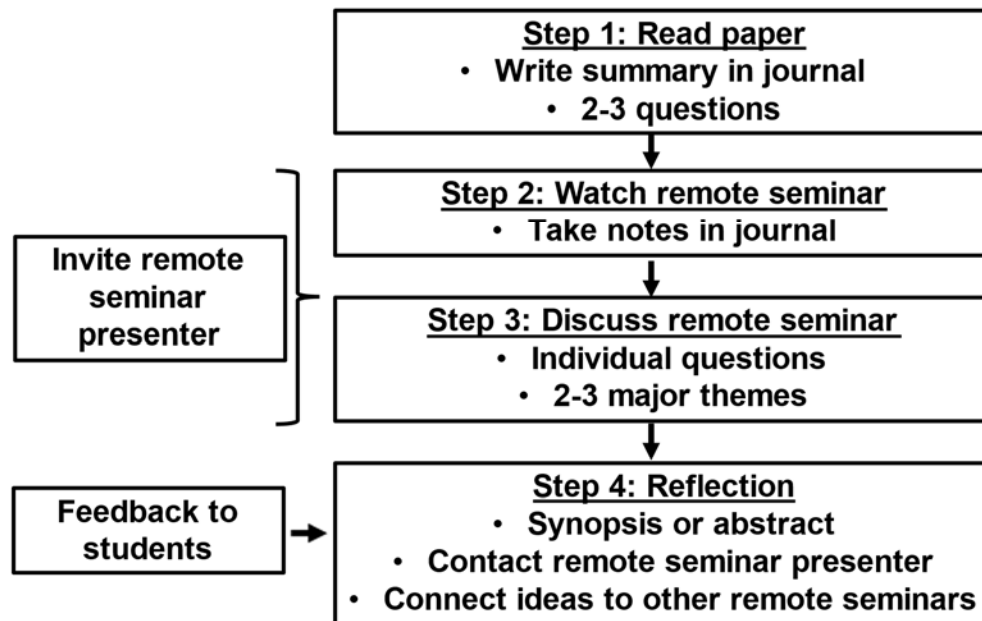
Teaching tool	Action by organizer of remote seminar	Examples of teaching activity by lecturer	How to access the tool
Online seminar attendance	Provide certificate of participation upon request and attendance	Students sign up and participate in remote seminar, receive credit.	Supplementary Material S1.
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 ¹
Teaching slides	Request that presenters make important slides available.	Include in lecture; provide online and ask for summary.	Available for free download on homepage ¹ and ResearchGate ²
Recorded seminar	Store recorded seminar on a video platform.	Summaries, discussion, essay, invite speaker. Creation of scientific communication material.	YouTube page of FINE ³

478 ¹<https://www.socialevolutionseminar.com/portfolio-3/project-two-f6cnw>

479 ²<https://www.researchgate.net/project/FINE-Teaching-Slides-for-Social-Evolution>

480 ³<https://www.youtube.com/channel/UCIXFO1pLpCTBy7vSwLWH-GA>

481
 482
 483
 484



485 **Figure 1**
 486