




Use of live streaming systems in field-based learning

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Abstract

Field-based learning is a key element in wildlife management curriculum as it is a valuable teaching tool for natural resource topics. There are multiple constraints that restrict use of field-based learning techniques in wildlife programs that have been complicated by the COVID-19 pandemic. Many academic programs were forced to rapidly transition to online instruction, but despite these difficulties, there was a need to provide interactive, in the field learning opportunities for students. This necessity resulted in the development of a live streaming system to provide an interactive learning experience (Leopold Live!). In this case study, we describe the technology used in Leopold Live! to augment an online, wildlife habitat management course at Texas A&M University, and the associated challenges and adjustments needed to improve delivery in the future. We conclude that Leopold Live! serves as a potential method to meet the challenge of providing interactive, field-based learning in a distance education setting.

KEYWORDS

distance education, field-based learning, live stream, natural resources education, wildlife management

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Integrated field-based learning has been a key staple in wildlife curriculum for many decades due to the value of experiential learning for topics related to natural resources. Benefits of allowing students to learn by interacting and participating in their subject matter are well documented (Davis 1993, Lewis and Williams 1994, Barr and Tagg 1995, Montgomery and Millenbah 2011, Wolter et al. 2011) and have been shown to be superior in fostering knowledge retention and skill application (Kendrick 1996, Springer et al. 1999, Kolb and Kolb 2006). There are, however, multiple constraints that prevent a more widespread use of field-based learning in wildlife programs.

Over the past several decades, the number of field-based, experiential learning opportunities for undergraduate students has decreased (Schmidly 2005, Hafner 2007, Fleischner et al. 2017) and simultaneously students face a more demanding and compressed curriculum that is increasingly placing a strain on their time (Matter and Steidl 2000, Millenbah et al. 2000, Lopez 2001, Fleischner et al. 2017). From a faculty perspective, the development and execution of field-based coursework requires increased creativity, effort, and time than traditional lecture or discussion-based classes (McCleery et al. 2005, Lopez et al. 2006, Lei 2010). Budget declines combined with an increasingly fractured and specialized teaching core (Millenbah and Wolter 2009) further limits the use of field-based learning in the classroom.

Facing a multitude of hurdles in providing meaningful field experiences to students, instructors were tasked with rapidly transitioning classes, sometimes in as little as 24 hours, to remote instruction due to the COVID-19 pandemic (Crawford et al. 2020). While distance education via online teaching is not a new pedagogical method and has been used for decades across various fields, there is still a deficiency in implementing online learning platforms (common learning management systems [LMS] include Canvas, Blackboard, Moodle, Desire2Learn) and methods for students ranging from kindergarten through university level courses (Ariza 2018). Online education, both synchronous and asynchronous, in natural resources curricula is new in comparison to other areas of study as a perceived barrier to the development of such courses is the lack of hands on, field experiences (Wuellner 2013). Comparatively, other STEM disciplines have a longer history of online instruction, such as engineering (Martin et al. 2019, Quinn and Aarão 2020, Zotova et al. 2021, Beneroso and Robinson 2022) and microbiology (Datta et al. 2020, Lacey and Wall 2021).

Despite the difficulties of teaching during the pandemic, there was a need to provide interactive, in the field learning opportunities for wildlife students. This need resulted in the development of a live streaming system to give students a field-based learning experience (Leopold Live!) via a social media platform. Our objective is to describe the use of a live-streaming system in teaching a traditionally field-based course, and some of the associated challenges and adjustments needed to improve delivery in future years. Specifically, we provide a case study using Leopold Live! in a wildlife habitat management course taught at Texas A&M University (TAMU); and review our methods for creating and broadcasting Leopold Live! segments. We will also explore the benefits and shortcomings of our approach and the possibility of use in other similar projects in natural resources education programs.

METHODS AND RESULTS

Streaming

Leopold Live! sessions were streamed weekly from September 23, 2020, to October 21, 2020, via Facebook Live through the Texas A&M Natural Resources Institute's Facebook page (<https://www.facebook.com/tamuNRI>). Each session focused on demonstrating variations of one of Aldo Leopold's five tools (axe, cow, plow, fire, or gun; Leopold 1933) and how they can be used for wildlife habitat management as it relates to the 1-d-1 (Open-Space) Agricultural Appraisal valuation program under the Texas Comptroller of Public Accounts (2018). Episodes were filmed using multiple video cameras mounted on a tripod connected to an external battery, wireless microphones, wireless video transmitters, a Blackmagic Design ATEM switcher and a laptop connected to a wireless hotspot and installed with Open Broadcasting Software (OBS; Figures 1, 2, and 3). The ATEM switcher allowed the film crew to be able to transition between cameras to capture a range of angles during the live stream and the OBS software broadcast the live stream directly to Facebook Live. The approximate cost of the streaming equipment was \$3,925 (Figure 1).

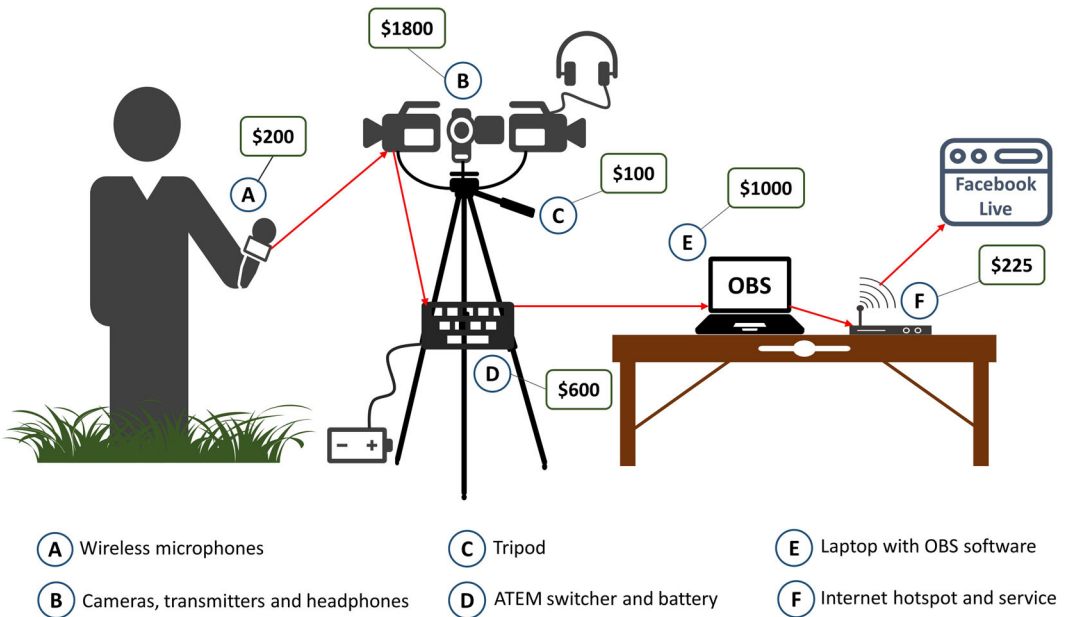


FIGURE 1 Leopold Live! live stream equipment set-up and associated costs.

One member of the NRI staff was trained for approximately 2 hours in how to operate the ATEM switcher and OBS software. Each live stream had a dedicated member from the NRI and BRP staff in charge of information technology (IT) and audio-visual (AV) components to ensure each session was broadcast as smoothly as possible. Episodes included at least one expert from the NRI or BRP staff and a guest speaker from an outside organization with expertise in the given topic. Following the presentation and demonstration of the wildlife management tool, the expert(s) and the speaker discussed associated challenges and considerations related to the episode topic. In addition, they answered questions from the live audience that included both students and members of the public. Time to produce each episode (graphic production, travel, rehearsal, set-up, shooting, and take-down) ranged from 10–12 hours. Comparatively, it takes the instructors 2–4 hours to produce the same lesson when the class is taught normally.

A total of five episodes were live streamed for Leopold Live! and they ranged from 38–57 minutes in length. All episodes were made publicly available, so they were accessible to students of the course, landowners, and members of the public. Students were highly encouraged to watch the sessions as they were live streamed, but allowances were made for those that had conflicts with the streaming schedule. Episodes were uploaded to the NRI YouTube channel within 24–48 hours for students to view at their convenience. In addition, topics covered in each episode provided information the students could use in writing their wildlife habitat management plan for the course. To date (June 2022), there have been 6,761 views on the NRI Facebook page and 845 views on the NRI YouTube channel for a total of 289.01 hours viewed across both platforms.

Wildlife habitat management course

The wildlife habitat management course (WFSC 406/636) is an online course for undergraduate and graduate students taught in the fall semester through the Department of Range, Wildlife and Fisheries Management at TAMU. The number of students enrolled in the course ranges from 65–100 individuals; a total of 80 students were enrolled in the course for the fall 2020 semester. Throughout the semester students work in teams to write a wildlife habitat management plan for a private landowner in Texas. Landowners are solicited each semester through the professional networks of the course



FIGURE 2 Cameras and tripod connected to battery power source (photo A); battery power source (photo B); Blackmagic Design ATEM switcher (photo C); and microphone, transmitter, and receiver (photo D) for use in live streaming a wildlife habitat management course in Blanco County, TX, USA.

instructors and can be located anywhere in Texas. The landowner property sizes vary, but range from 10 to 3,500 acres. Property uses also vary depending on the location in the state and the landowners' goals, but the majority are mixed use for agriculture, ranching, hunting and recreation. In addition, plans are required to include at least three management practices to comply with the 1-d-1 (Open-Space) Agricultural Appraisal valuation and the Texas Parks and Wildlife Comprehensive Wildlife Management Planning Guidelines (https://tpwd.texas.gov/landwater/land/private/agricultural_land/) for their specific ecoregion.

Filming location

Leopold Live! sessions were filmed at the Selah, Bamberger Ranch Preserve; an approximately 2,226-ha property located in Blanco County, Texas, USA. The BRP currently operates as a 501(c)3 non-profit and has become a recognized model of environmental education, habitat restoration and land stewardship in Texas.



FIGURE 3 Filming equipment set up for streaming in the field at Bamberger Ranch Preserve, Blanco County, Texas, USA.

DISCUSSION AND IMPLICATIONS

The two main challenges associated with Leopold Live! production were ensuring consistent internet connectivity and occurrences of equipment malfunction in the field. Facebook Live requires an internet upload speed of 3-4 megabits per second (Mbps) to stream a video at HD 720p, 60 frames per second (fps). This also requires a video bitrate range of 2,250 to 6,000 kilobits per second (Kbps; Facebook 2021). The mobile hotspot used in production has an average upload speed of 2 to 5 Mbps, causing the video to be lower quality and some segments to either lag or freeze during the live stream. We also faced audio quality and connectivity issues during a few episodes, generally due to a lack of experience in troubleshooting audio equipment, and most of these issues were resolved with time and the assistance of a professional audio engineer. The engineer was an employee of NRI and volunteered his expertise at no additional cost to the project.

All students enrolled in the course were emailed a required survey via SurveyMonkey (<https://www.surveymonkey.com/>) in November 2020 and were given one week to respond. The survey was comprised of five questions that were meant to gauge their satisfaction with the final episode (prescribed fire) and the Leopold Live! series as a teaching tool and to provide feedback on how the series may be improved in future iterations. Seventy-eight students (97.5% of the class) responded to the survey with most students responding positively to Leopold Live! as a teaching tool with the majority also stating that the technology used in Leopold Live! brought the outdoor learning environment to them: 42.86% strongly agree and 50.65% agree. While it is not possible to measure learning impact based on our survey results, they do illustrate that the Leopold Live! episodes were a positive experience for the students.

There has been an increase in online courses and in turn the use of video to enhance learning for students (Schneps et al. 2010). Video can provide an avenue for increased access to demonstrations to online students by illustrating real-life practices in the field and by highlighting visual information that would be impractical to sufficiently describe either verbally or through readings (Choi and Johnson 2005, Schneps et al. 2010, Rasi and

Poikela 2016). This is particularly important in STEM subjects as this can reduce the cognitive load for students to try to bring topics to life or carrying out mental animations to make sense of concepts (Castro-Alonso et al. 2018, Lacey and Wall 2021). Research has shown the maximum median engagement time for educational videos is 6 minutes, so making videos longer than 6–9 minutes is a waste of effort for instructors (Guo et al. 2014). Leopold Live! episodes were quite a bit longer than the optimal time range. For future iterations of the course, the information in the episodes could be segmented using YouTube Annotate to increase learner engagement with the videos (Brame 2016).

The COVID-19 pandemic has necessitated changes to traditional education systems, and Leopold Live! could potentially serve as an effective way to deliver an online wildlife habitat management class or other natural resource related educational opportunities in the field. Leopold Live! provided an opportunity to create a community of learning and practice with key experts in the field of wildlife habitat management for both students and members of the public. Each episode provided a variety of topics and experts for viewers to interact with, but we also maintained consistency by having the same instructors/facilitators each week. The consistency in instructors/facilitators provided continuity and a continued sense of presence for students which is an important aspect for engaging distance education learners (Lehman and Conceição 2010).

Video has been shown to support ubiquitous learning and has given tangible benefits to students (Schneps et al. 2010, Ramlogan et al. 2014, Taslibeyaz et al. 2017, Carmichael et al. 2018). The investment of time and money required to create videos is low compared to traditional extension programming, and once they are created, they can continue to serve as an educational resource indefinitely. These videos can be used in multiple types of settings such as field trips, landowner workshops and other field review activities (e.g., assessing a project with individuals not located on-site), all features that are especially appealing in the current climate of natural resource education. Our videos will use this well-established and rapidly growing format to connect with new generations of natural resource managers and private landowners in a unique way.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ETHICS STATEMENT

The student survey was sent out by the course's major professor as a part of the classroom instruction and was exempt from IRB review.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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