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Streaming Science #2: Using Webcast Electronic Field Trips for Engagement with Your Target Audience[1]

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Introduction

This is the second publication in the *Streaming Science* EDIS series focused on how to use mobile hardware and software for engagement with your target audience. The following article focuses on how to use mobile hardware and cloud-based software for streaming live webcast electronic field trips (EFTs). *Streaming Science* utilizes EFTs to connect university scientists and Extension professionals across a variety of subject matter areas and contexts with PK–12 students around the world.

Increased Use of Digital Technologies

People are using mobile technologies more than ever before (Perrin & Kumar, 2019), and most Americans (97%) own a mobile phone (Pew Research Center, 2021). Online video streaming and visual social media platforms continue to increase in popularity. It is estimated that 86% of the total US population is aware of the video-based social media platform TikTok (Edison Research and Triton Digital, 2021), and YouTube's online video platform audience is projected to grow to 210 million people in 2022 (Ceci, 2021).

Online videos can also be used for teaching and learning. More institutions and instructors use mobile and online video streaming technologies for educational purposes to engage learners in interactive and visual ways at a distance (Hague, 2009; Lederman, 2018). School-based teachers and youth are often in need of low-cost, virtual learning experiences that allow them to learn about environments and spaces outside of the classroom (Cassady et al., 2008; Greene et al., 2014). While EFTs have emerged over the years, COVID-19 escalated the demand for live, innovative, interactive remote teaching and learning (Lockee, 2021).

Providing dynamic and memorable online educational experiences via mobile technologies for target learners in both formal and nonformal spaces is imperative in the 21st century's Information Age. The *Streaming Science* EFT webcast model provides an effective and efficient learning experience via easily accessible mobile technologies (Loizzo et al., 2019). Rationale, technology needed, and program formatting suggestions are provided based on the authors' experiences designing and implementing EFTs. Youth or adult formal or nonformal educators and communicators such as Extension agents, scientists, and teachers can customize and utilize information from this article to develop and implement EFTs in their own settings.

EFT Model

An EFT can follow several different formats and use varied technological approaches. At its core, an EFT is

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an instructional and communication technology (ICT) approach and tool to connect two locations for interaction and learning via a live video webcast (Cassady et al., 2008; Loizzo et al., 2019). The *Streaming Science* EFT webcast model includes (a) a field or lab-based site featuring subject matter experts such as university scientists, Extension professionals, or student experts within specific STEM areas; (b) mobile communications technology with synchronous internet connection; and (c) a receiving site/target audience such as middle and high school students viewing in a remote, internet-accessible classroom or other location in or outside the United States. Ultimately, the *Streaming Science* EFT model is designed to provide distance learners in multiple locations with an opportunity to learn from scientists in real-time via live web-streamed video and chat. The suggested EFT model can be achieved through the following production process.

Production Process

When developing an EFT, it is recommended to follow a preproduction, production, and postproduction process.

PREPRODUCTION—CONTENT DEVELOPMENT, AUDIENCE RECRUITMENT, PRACTICE

Identify the EFT topic, location, and target audiences. Spend time with subject matter experts in the beginning to narrow down the key messages. To create content at participating learners' knowledge or grade levels, the subject matter experts may need coaching and practice based on their comfort level and ability with science communication. When working with PK–12 audiences, consider linking content to state and national science education standards, and develop EFT learning objectives to support schools' curriculum efforts. EFT developers and featured subject matter experts should work together to outline program content in storyboard or script format as well as shoot and edit any photos or video clips that will be played during the EFT. Identify visuals, such as photos, props or demonstrations, and organize them to match the message the content experts aim to convey.

During this phase, develop an online presence, such as a website, a blog, an email listserv, or social media, to recruit target audiences such as teachers or librarians to register and participate in the EFT. For example, *Streaming Science* uses the WordPress content management platform for EFT informational pages, Mailchimp to maintain a list of teacher contacts and direct email, and Facebook, Twitter, and Instagram for promotion and recruitment. Tools such as Google Forms and Eventbrite are ideal for creating a registration pathway and information management for potential participants to provide background information such as contact email addresses, attendance numbers, grade level of participants, and other predetermined details the EFT developers would like to identify about the audience as evaluation measures. Testing the internet connection and live video streaming equipment and rehearsing with the production team and content experts are also important steps to ensure everyone is prepared prior to the live EFT.

Figure 1. Behind the scenes photos of "The Buzz about Bees" EFT in November 2021.
Credits: Jamie Loizzo, UF/IFAS

PRODUCTION—HARDWARE AND SOFTWARE, TEAM ROLES, CONTENT FORMAT

The *Streaming Science* EFT model utilizes cost-effective mobile hardware and cloud-based software for live webcasting. Provided below is a list of the hardware and software used and some considerations for each:

- Internet Connection—If a locally established internet or Ethernet connection is limited or not available, a mobile internet hotspot such as the Verizon MiFi JetPack is beneficial for video streaming. Make sure to check internet provider maps and test connection speeds with a mobile application such as Speed Test & Wifi Analyzer+.
- iPads and/or iPhones (4)—Up to three iPads or iPhones are used as video cameras from different angles, and one iPad serves as the hub for all the content (used by the director).
- iPad Rigs (Stabilization)—There are a variety of rigs/cases to outfit an iPad so that it can physically connect to video production accessories. Consider using a case such as an iOgrapher or another similar stabilization rig.
- Tripods/Monopods (Stabilization)—These are also suggested for camera stabilization. The iPad can get quite heavy and shaky after a couple of minutes of holding. Tripods and monopods will steady the iPads and improve the image quality.

- Microphones—On-camera hosts and guests should use handheld or lavaliere microphones for the clearest quality audio (smartphone wireless microphone systems such as Samson Go Mic Mobile or iRig Mic Lav are some options).
- Webcast Software—A mobile application such as Switcher Studio is recommended for a live webcast video stream. Switcher Studio connects iPads to one another to operate similarly to a television broadcast control room. The appallows one iPad to operate as a director and switch between other iPads/iPhones serving as different camera angles, as well as preloaded photos, videos, and graphics.
- Viewing Website—The live video web-stream should be sent to a website for the target audience to view. YouTube, social media channels, and more can host live videos. *Streaming Science* EFTs use IBM Video Streaming/ UStream.TV as the hosting and viewing website. The Switcher Studio mobile app can connect with a Real Time Messaging Protocol (RTMP) address from IBM Video. The IBM Video platform includes live chat and polling for target audiences to send in questions and responses live throughout an EFT.

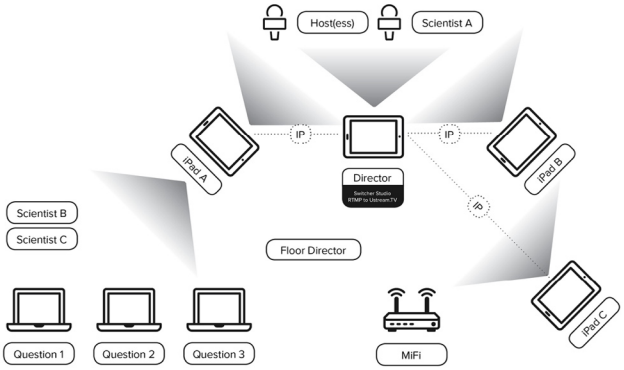

Figure 2. A Diagram of the *Streaming Science* Production Setup. Credits: Loizzo et al. (2019)

The live *Streaming Science* EFT content format has evolved over the years based on target audience feedback and overall production experiences. The live program run time is usually between 45 and 50 minutes and includes three different segments separated by a question-and-answer session. The segments focus on different subtopics within the overarching EFT theme and are about 15 minutes in length. The format typically looks like the following:

- Topic A—Segment One (10 minutes)
  - Q & A about Topic A (5 minutes)
- Topic B—Segment Two (10 minutes)
  - Q & A about Topic B (5 minutes)
- Topic C—Segment Three (10 minutes)
  - Q & A about Topic C (5 minutes)

Learners tuned into the EFT submit questions via the chat function of the IBM Video Streaming platform, and the producers can post polls for the audience to answer. During the five-minute question-and-answer sessions, the scientists answer some of the learner-submitted questions, and the responses to the poll questions are revealed.

POSTPRODUCTION—TARGET AUDIENCE FOLLOW-UP AND ANALYTICS

After an EFT, it is ideal to follow up with the target audience. EFT developers should send an email to registered participants with:

- links to recordings of the EFT,
- reminders of any wraparound materials or activities audience members could complete to reinforce or expand learning of EFT content,
- subject matter experts' answers to frequently asked questions (FAQs) participants submitted during the program, and
- suggestions for staying connected to any community of practices (CoPs), or email listservs related to the EFT.

Additionally, it is ideal to measure EFT impacts on participants' content knowledge, attitudes, and/or behavior intentions via pre/post or retrospective postevaluations and viewing analytics from the livestreaming platform. More recommendations for developing a CoP and assessing EFTs can be found in articles six and seven of this EDIS series.

Program Examples

Since 2016, *Streaming Science* has developed, implemented, and evaluated several different EFTs. Graduate and undergraduate students at the University of Florida and University of Nebraska–Lincoln worked with the lead author to create and research EFTs for formal and nonformal middle and high school–aged audiences:

- *Ranches, Rivers, and Rats*—The interconnectedness of agriculture, water, and kangaroo rats in the Nebraska sandhills ecosystem in partnership with the Platte Basin Timelapse project.
- *Sun Rays and Windy Days*—How solar panels and wind turbines are used for alternative energy sources in partnership with Nebraska Extension.
- *Bats and Beyond*—An overview of bats, bat collections, and related population genetics research streamed from

University of Florida bat houses in partnership with the Florida Museum of Natural History.

- *Conservation Conversation*—Focused on fire ecology, forest conservation, and forest animals and plants in partnership with the UF/IFAS Austin Cary Forest for teaching and research.
- *The Buzz about Bees*—Bee biology, a live beehive demonstration, research to protect bees from mites, and related careers in partnership with the UF/IFAS Honey Bee Research and Extension Laboratory (HBREL).

To view recordings of the above listed programs and for information about future EFTs, visit the *Streaming Science* website, follow related social media, and join the email listserv or Google Classroom.

Summary

Mobile technologies are a readily available resource for most Americans, and many are using their mobile devices for educational purposes. An opportunity exists for formal and nonformal educators and communicators to develop communication and education experiences for youth and adult audiences via mobile technologies. The *Streaming Science* EFT model provides formal and nonformal educators and communicators a template to create an educational experience for their learners to connect with experts in specific topic areas.

Formal and nonformal educators and communicators should consider providing EFT experiences about the following themes to virtually take audiences to places they might not physically be able to visit:

- agriculture (growing row crops, fruits, vegetables, and herbs; raising livestock; production agriculture; aquaculture; nursery and greenhouse production; organic production),
- natural resources (ecosystems and environments; water-based resources; environmental stewardship in action), or
- family resources (cooking demonstrations; nutritious purchasing habits; practicing healthy living).

Developing and delivering an EFT requires a level of intentionality to ensure an educational, fun, immersive, and efficient experience. Consider the following points to achieve an effective EFT experience:

- Educational
  - Develop attainable and measurable learning objectives for your learners and participants, and be sure to develop an evaluation instrument that measures those objectives to determine the EFT learning outcomes.
- Fun
  - Host the EFT from an exciting location. Invite experts who are skilled at engaging appropriately with the target audience age group or who are willing to learn about effective science communication. Work in content that meets the program's educational objectives. It should also be engaging and exciting!
- Immersive
  - Provide educational activities for the target audience to engage with before and/or after they participate in the EFT. Wraparound experiences can help learners engage in the content for a longer time and allow them to connect the content to places, spaces, and ideas they are familiar with.
- Efficient
  - Have a central hub for all things EFT. Somewhere for educators to learn about what the EFT offers, register their students/participants, access the Teachers' Guide, download wraparound experience activities, find the link to participate in the EFT, and attach the recording of the live EFT to revisit.

Supplemental Information

The *Streaming Science* EFT model is ever evolving based on research, teaching and learning experiences, and evaluation feedback. To learn more about the model and related research in greater detail, review the following academic peer-reviewed professional development and scholarly articles:

- Loizzo, J., Harner, M., Weitzenkamp, D., & Kent, K. (2019). Electronic field trips for science engagement: The Streaming Science model. *Journal of Applied Communications*, *103*(4).
- Loizzo, J., & Beattie, P. (2019). Self-study of a project-based graduate science communication course focused on electronic field trip development. *Journal of North American College Teachers of Agriculture*, *63*(2), 26–36.
- Beattie, P. N., Kent, K. W., Suits, T. E., Loizzo, J. L., & Bunch, J. C. (2021). Bats and beyond: Communicating wildlife and climate change empathy to youth through an electronic field trip. *Journal of Southern Agricultural Education Research, 71*.

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Pew Research Center. (2021). *Mobile fact sheet*. https://www.pewresearch.org/internet/fact-sheet/mobile/

Appendix A: *Streaming Science* Series Overview

Streaming Science #1: An Introduction to Using Mobile Devices for Engagement with Your Target Audience

Introduces the *Streaming Science* platform, the mobile technologies students have used to contribute work to the Streaming Science platform, and an overview of types of content created for Streaming Science using mobile technologies.

Streaming Science #2: Using Webcast Electronic Field Trips for Engagement with Your Target Audience

Describes the webcast electronic field trip (EFT), how Streaming Science has used the webcast EFT format, and considerations for using this type of instructional and communication technology.

Streaming Science #3: Using Scientist Online Electronic Field Trips for Engagement with Your Target Audience

Describes the Scientist Online EFT, how Streaming Science has used the Scientist Online EFT format, and considerations for using this type of instructional and communication technology.

Streaming Science #4: Using Podcasts for Engagement with Your Target Audience

Describes podcasting, how Streaming Science has used podcasting, and considerations for using this type of instructional and communication technology.

Streaming Science #5: Using Virtual Reality Tours for Engagement with Your Target Audience

Describes virtual reality, how Streaming Science has used virtual reality, and considerations for using this type of instructional and communication technology.

Streaming Science #6: Using Google Classroom for Engagement with Your Target Audience

Describes Google Classroom, how Streaming Science has used Google Classroom to host a community of practice, and considerations for using this type of instructional and communication technology.

Streaming Science #7: Using Evaluation to Assess Engagement with Your Target Audience via Mobile Technologies

Describes how Streaming Science has used evaluation measures to determine engagement with target audiences through mobile technologies.