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Leveraging Skype in the Classroom for Science Communication: A Streaming Science – Scientist Online Approach

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Leveraging Skype in the Classroom for Science Communication: A Streaming Science – Scientist Online Approach

Abstract

A growing need exists to identify, implement, and research alternative methods to communicate with, educate, and engage youth about science, in order to increase science literacy and knowledge of future societal decision-makers. Electronic field trips (EFTs) are one channel of non-formal communication and education that have been introduced in agricultural and natural resources to reach youth audiences with science-based information in real-time. EFTs can be conducted in several different ways due to the proliferation of video production and web-streaming technologies. The following professional development article offers science communication professionals and scientists a detailed model and specific steps to develop and host an EFT via the Skype in the Classroom platform. The outlined model builds off of prior application and research from the Streaming Science online science communication platform and offers a secondary model for effective EFT implementation and research. The authors describe the establishment of an online science communication network, the development of the *Streaming Science: Scientist Online* format, content creation, the production team structure, and mobile production hardware and software. *Scientist Online* EFT program outcomes in terms of participation are noted, as well as student outcomes in the form of excerpts to demonstrate student engagement are shared.

Keywords

electronic field trip (EFT), Skype in the Classroom, science communication, Streaming Science, Scientist Online

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Introduction

There is an increasing need to communicate with and educate youth about science (Committee on STEM Education, 2018). Many agricultural and environmental concepts can be found underneath the larger science umbrella (Bareja, 2019; eXtension, 2014; National Geographic, 2011). A need exists for youth to understand science's relation to agriculture, the natural world, and vice versa (FAO, 2015; USDA, n.d.). Electronic field trips (EFTs) are non-formal communication and education experiences typically streamed through a live interactive web-broadcast to connect content experts with public audiences/learners. EFTs can vary greatly in format and content. However, EFT producers employ instructional and communication technologies to ultimately deliver the digital, educational programs from a remote location to youth in formal learning environments (Adedokun et al., 2011; Cassady et al., 2008; Greene et al., 2014; Knapp, 2010; Loizzo et al., 2019; Rudmann, 1994; Sriarunrasemee et al., 2015). Youth who participate in EFT experiences have the opportunity to develop positive attitudes toward STEM (i.e., science, technology, engineering, and math) and have shown an increased retention of science-based information (Knapp, 2010; Rudmann, 1994). Concurrently, there is a growing need to find alternative methods to communicate with and provide educational experiences for youth (Greene et al., 2014). EFTs are one way for students to communicate with scientists and gain educational experiences, if constraints for participating in a physical field trip are present (Cassady et al., 2008). EFTs have become a tool that has gained traction over the years. EFT impacts have included increased student science engagement, increased self-efficacy, STEM career interest, and critical thinking (Adedokun et al., 2011; Sriarunrasemee et al., 2015).

There are multiple formats to conduct and host EFTs. Adedokun et al. (2011) conducted Purdue zipTrips which were EFTs developed and aired on television for middle school students to engage with scientists. The duration for zipTrips was 45-minutes and included a live, in-studio audience, engagement with scientists, live experiments, and prerecorded segments (Adedokun et al., 2011). Loizzo et al. (2019) explained how to conduct EFTs in a live webcast format utilizing mobile devices to connect with multiple audiences in classrooms around the world at two scheduled times. The webcast EFT format consisted of three segments. Between each of the three 15-minute segments, there were live question and answer sessions with the scientists responding to submitted questions from the student audience.

This professional development article focuses on an additional implemented and tested model for EFTs called *Streaming Science: Scientist Online* via the Skype in the Classroom platform. In the past, scientists have mentioned that a barrier of the webcast EFT format is limited ability to interact with the students and gauge audience interaction and interest (Loizzo & Beattie, Accepted). Conducting an EFT via the Skype in the Classroom platform allows for a more direct, one-on-one contact between a smaller group of students and a scientist as compared to the webcast EFT format. The detailed methods and procedures are outlined for conducting a Skype-based EFT via a one-on-one, dialogic format to engage youth audiences in agricultural concepts through science-based content with real-life scientists.

Procedures

The following procedures of establishing a science communication network, EFT format development, content creation and team structure, and mobile software and hardware are

outlined in the following sections to demonstrate the scientist-to-school Skype in the Classroom EFT process.

Establish a Science Communication Platform

Streaming Science (https://streamingscience.com) is an online platform that features and delivers student-developed science communication projects, as well as serves as an education network for PK-12 teachers and students to access science communication multimedia and EFT programs. Students who have enrolled in courses in the Agricultural Leadership, Education and Communication Department at the University of Nebraska-Lincoln and Agricultural Education and Communication Department at the University of Florida have contributed to the platform in a variety of ways. Since 2017, the platform offered four webcasted EFTs, one *Scientist Online* EFT via Skype in the Classroom, 27 photo essays on topics related to agriculture and natural resources, 34 podcasts with the most recent 15 tracks comprising a series called *The Science of Superstorms*, 25 agricultural and natural resources related videos, and four blog posts. There were 31 new posts to Streaming Science website over the course of the 2019 year that attracted 7,521 views from 2,383 visitors. Streaming Science is present on Facebook (@Streaming Science), Twitter (@Streaming_Sci), and on Instagram (@studentsstreamingscience). An email address listerv has been developed over the years by adding the email addresses of 143 teacher subscribers who have participated or have been interested in participating in a Streaming Science EFT.

Development of the *Streaming Science: Scientist Online* Format

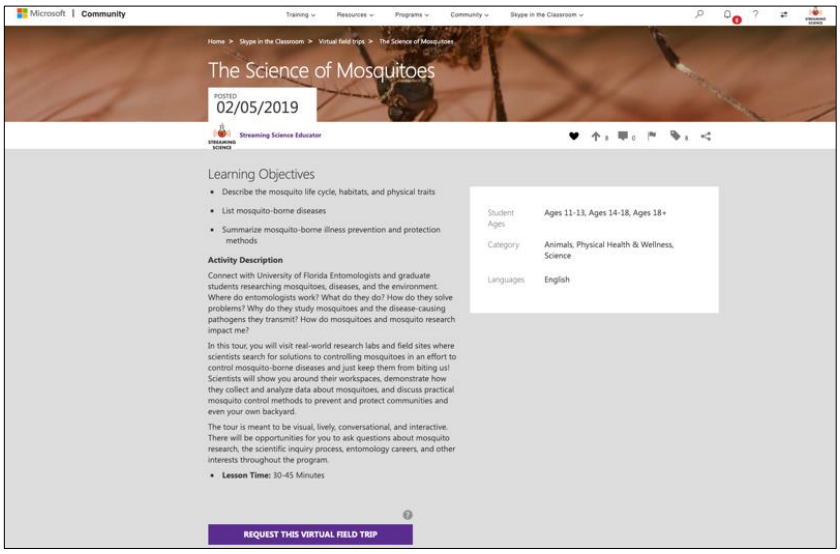
The first-ever *Streaming Science: Scientist Online* EFT format via Skype in the Classroom occurred in the spring of 2019 as a new science communication and education effort produced by the platform's team. This format differed from original Streaming Science EFTs (Loizzo, et al., 2019) in that the *Scientist Online* format leveraged Skype in the Classroom for a one-on-one, scientist-to-school connection versus the prior scientists-to-many schools format (i.e., webcast format). Funding for this project was provided by the Florida Department of Health (FDOH) through a grant awarded to the University of Florida Institute of Food and Agricultural Sciences Center for Public Issues Education (UF/IFAS Pie Center). The overarching objective of the grant was to educate and increase public awareness of mosquitoes, mosquito-borne illnesses, and mosquito control. Streaming Science's task for assisting in meeting the grant objectives was to educate youth about the aforementioned mosquito topics. More specifically, the learning objectives for the participating youth were: (a) to describe the mosquito life cycle, habitats, and physical traits; (b) list mosquito-borne diseases; and (c) summarize mosquito-borne illness prevention and protection/control methods.

The *Scientist Online* EFT was hosted via the Skype in the Classroom platform and the Skype application. Skype in the Classroom is a community powered by Microsoft Education (https://education.microsoft.com/skype-in-the-classroom/overview; Microsoft, n.d.). Teachers from around the world are invited to become a member of the Microsoft Educator Community by creating a free account on the Microsoft Educator web page (Microsoft, n.d.). Teachers' membership to the community allows them to be notified when new Skype in the Classroom experiences are available, based on the filters they identify and set (Microsoft, n.d.). The Streaming Science team made *Scientist Online: The Science of Mosquitoes* available for six

different days between April 11-25, 2019 in two-hour blocks for Microsoft Educators to register for the program (see Figure 1). The EFT program was approximately 35-45 minutes in length, allowing for up to four potential EFTs to be hosted in the two-hour time block. In total, the Microsoft Educators had 24 possible time slots from which to choose. Educators use the Skype mobile application or Skype website to connect with scientists and hosts in real-time during the EFT.

Figure 1

Teacher Registration Page Screen Capture



Content Creation and Production Team Structure

Collaborating scientists and the Streaming Science communication team developed the *Scientist Online: The Science of Mosquitoes* content. The team included three entomologists and five agricultural communicators (Table 1). The agricultural communicators worked with the scientists in advance of the *Scientist Online* EFT to develop key discussion points and plans for potential variations in age groups. The outline helped ensure the scientists covered the same topics across all EFTs and highlighted the identified learning objectives. The agricultural communicators and scientists worked collaboratively to create visual aides to display on screen during the program, in addition to other visual elements to enhance discussion. The visual media the scientists utilized for included a PowerPoint with images of mosquitoes, physical plastic model pieces to represent the mosquito life cycle, and a box of live mosquitoes.

Table 1

Description of Streaming Science Team Members

Type	Academic Classification	Department
Scientists	Assistant Professor	Entomology and Nematology
	PhD Student	Entomology and Nematology

	Master's Student	Entomology and Nematology
Agricultural Communicators	Assistant Professor	Agricultural Education and Communication
	PhD Student	Agricultural Education and Communication
	PhD Student	Agricultural Education and Communication
	Master's Student	Agricultural Education and Communication
	Master's Student	Agricultural Education and Communication

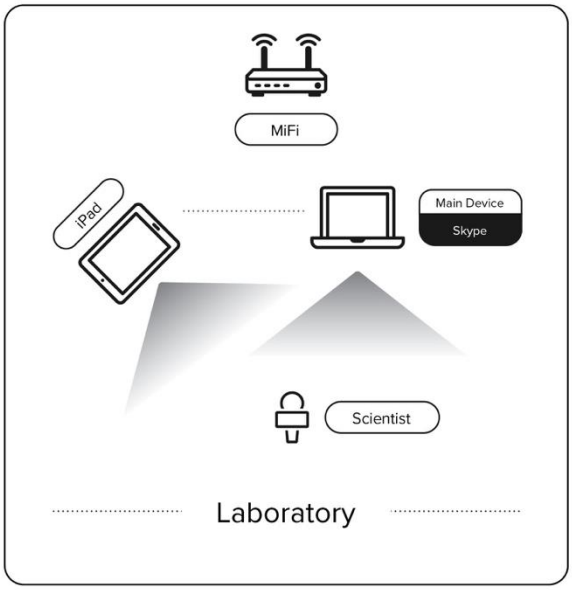
Each scientist took turns hosting a session in an entomology lab, Lucky Lab, at the University of Florida with a variety of props (i.e., models of the mosquito life cycle, a box of live mosquitoes, and a tour of the lab). At least two agricultural communicators were present for each session to set up the main laptop connected to the participating classrooms via Skype for scientist use, operated an additional iPad for additional views and close-up angles, as well as maintained contact with teachers. Both the laptop and the iPad were connected to the classroom at the same time. See Figures 2 and 3 for a visual understanding of the production layout.

Figure 2

Skype in the Classroom Production Layout

Figure 3

Streaming Science Scientist Online EFT Production Layout Model



Additional resources provided to classroom teachers included mosquito lesson plans and videos produced by the larger grant team for teachers to maximize student learning before and/or after the EFT. The agricultural communication team developed a Teacher's Guide (see Table 2) and shared it with schools via the program's website.

Table 2

Contents Included in the Teacher's Guide

Materials needed to participate in the EFT	A Microsoft Education profile A Skype account A device with a webcam and microphone A quality internet connection Excited students
Tips for participating teachers	Updating Microsoft Educator profile to include ages and subjects taught Additional information for the Streaming Science team to get to know the teacher and classroom before beginning
Tips for ensuring an EFT is the correct one for the teacher's specific class	Adjust the filters provided by the Microsoft Education platform to match the teacher's classroom (i.e., age, subject, location, dates and times available) Confirm time zones ahead of time to ensure time adjustments are accurate for scheduling and smooth connections
Frequently asked questions include:	Length of EFT How to get connected via Skype Any preparation needed beforehand

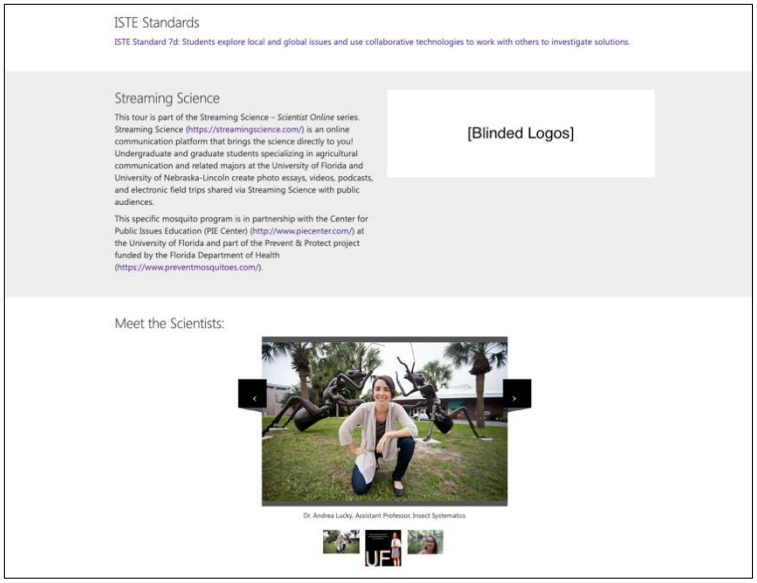
Mobile Production Hardware and Software

Producing an EFT via the Skype in the Classroom platform required minimal equipment and technology. Only one device was required to conduct an EFT using Skype in the Classroom, however the team used multiple devices for the The Science of Mosquitoes program as an effort to enhance the student experience through close-up angles and movement around the research lab. The agricultural communicators provided the technology, which included one laptop and one iPad with Skype downloaded to each device. Additional equipment used for production included a tripod laptop stand and dolly to hold the laptop at a height comfortable for the scientist to interact with the classroom of students. With the use of a dolly, laptop, wireless internet connection, and a Bluetooth lavalier microphone for the scientist, the scientist was able to move freely throughout lab. The production team used an iOgrapher case for the iPad to ensure more stable video framing for a quality experience (iOgrapher cases can be found at https://www.iographer.com). The Bluetooth lavalier microphone's receiver was connected to the laptop, which served as the "main device" of the program's connected devices. Because the scientist was able to hear audio from the connected participants through the laptop, earbuds or headphones should be connected to the iPad (or other additional, connected devices) to prevent audio feedback from the additional device. Optional lenses for iPad and the iOgrapher cases are available for purchase, if wide angle or telephoto shots are desired. The scientist provided the additional materials needed to convey the content to the students (i.e., plastic model mosquito life cycle, box of live mosquitoes, and PowerPoint slides with mosquito images).

The agricultural communication team reached out to and met with Microsoft employees with Skype in the Classroom to discuss how the Microsoft Educator community and Skype software could be leveraged to interact with classrooms. The Skype in the Classroom team walked the agricultural communication team through how the registration/content site worked and how to customize it. The agricultural communication team drafted content and images for the site and sent the draft to the Skype in the Classroom team. The Skype in the Classroom team developed the registration and content site for *Scientist Online: The Science of Mosquitoes* with an attached link to go live. An image of the site can be viewed in Figure 3.

Figure 3

Scientist Online: The Science of Mosquitoes Microsoft Education Site Screen Capture



The agricultural communicators prepared two laptops and two iPads ahead of the live programs, in an effort to resolve any potential hardware and software issues that may arise. The agricultural communicators ensured that all devices, including the Bluetooth lavalier microphone, were charged and included new batteries. All of the devices were connected in a single Skype call using the Skype app. In order to do this, each device needed a unique Skype account. Skype accounts were created for each device/role (i.e., "Streaming Science Educator" = main device/laptop and "Streaming Science Lab Assistant" = additional device/iPad). The Skype call was initiated on the main device/laptop, which was then used to "call" or connect the other device. The team checked audio levels during the setup of the gear using Skype's audio testing features, but after being connected with the school, the production crew ensured that the participants were able to clearly understand and hear the scientist at the beginning of the call.

Outcomes

Fifteen teachers originally signed their classes up to participate in The Science of Mosquito EFT program. However, only five classrooms followed through with participation due to a number of factors such as time zone misunderstandings and teacher illness. There was an average of 20-30 students in each classroom and a total of approximately 150 students who participated across all five EFT sessions. Two of the classrooms were located in Pennsylvania, one classroom in Canada, one classroom in Florida, and one classroom in Pakistan. One of the classrooms in Pennsylvania combined three classrooms for the program with a total of 75 students present. The classroom in Pakistan was an all-male boarding school that allowed the students to gather during the night to participate in the EFT, due to the time difference.

Student Thoughts about the *Scientist Online* EFT Program

The agricultural communication team collected data in relation to the students' participation in the EFT program. Participating classroom teachers distributed a retroactive pre/ post-survey developed by the agricultural communication team to students at the completion of the EFT. A

total of 60 useable surveys were returned. Students' responses to items about the program content and quality are included in this paper. Additional results about students' changes in mosquito content knowledge are the focus of papers to follow.

The students were asked to rate their thoughts regarding the *Scientist Online* EFT program on a 5-point, Likert-type scale (see Table 3).

Table 3

Students' Thoughts Regarding the Scientist Online EFT Program

I thought…	M	SD
I like entomology.	2.78	1.03
I learned about careers in entomology from the scientist.	3.22	1.03
It is important that we learn about mosquitoes.	3.68	.93
The topic was interesting.	3.75	.84
The program was easy to hear.	3.78	.89
The scientist talked about something I did not know already.	3.80	1.07
The program was easy to see.	3.85	.92
The scientist was interesting.	3.92	.77
The scientist gave an interesting demonstration to explain mosquito research.	4.05	1.00
The scientist communicated at a level that I understood.	4.10	.78
It is important that we learn about mosquito-borne illness.	4.25	.80
I would recommend this program to other classes.	4.27	.86
The scientist was knowledgeable about the topic.	4.33	.93
The scientist did a good job answering questions.	4.35	.78

Real limits of the scale: 1.00 – 1.49 = *strongly disagree*, 1.50 – 2.49 = dis*agree*, 2.50 – 3.49 = *neutral*, 3.50 – 4.49 = *agree*, 4.50 – 5.00 = *strongly agree*

Students reported being *neutral* in regard to their thoughts relating to *I learned about careers in entomology from the scientist* and *I like entomology*. The students indicated their thoughts were in *agreement* with all of the remaining statements.

Student Engagement with Scientists

The Skype calls between the classrooms and the scientists were recorded and transcribed. The scientists engaged in dialogue with students based on the three objectives for the EFT program as demonstrated in Table 4.

Table 4

Excerpts from Skype Calls

Classroom	Excerpt #	Excerpt

Objective 1: Describe the mosquito life cycle, habitats, and physical traits protection/control methods			
Pennsylvania 2	1	Scientist:	[Shows students a box of mosquitoes and puts her hand inside] These mosquitoes, I'm gonna see if they're hungry. I'm just gonna stick my hand inside, and we're gonna see if these mosquitoes want any food. Look at that. They are so hungry. Ready? They're all so hungry.
		Students:	Wow!
		Scientist:	*[Laughter]* I'm gonna take my hand out before they bite. I didn't let them bite me, but these mosquitoes are obviously very, very hungry. Did you guys know that the only mosquitoes that were trying to bite me inside this cage, they're female mosquitoes? The male mosquitoes do not bite. Can I have person come in front of the computer and tell me why they think that mosquitoes need to feed on blood?
		Student:	So they can survive
		Student:	Okay. Make food for their young. No?
		Scientist:	They need to have young. Right? They need to be able to lay eggs. Male mosquitoes don't have to lay eggs, so the female mosquitoes actually take a blood meal so that they can lay their eggs. That's why males don't need to take a blood meal.
Pennsylvania 2	2	Student:	What would happen if like—so I know that [teacher] said that they're normally in still water, in like a cup or something, so what would happen if the eggs were in there, and then someone poured it out? What would happen?
		Scientist:	You might be my favorite person today. That's the best question because that's a really important thing that we can do to get rid of mosquitoes. Mosquitoes, they live in the water, right? If they live in a bird bath or a water trough or something like that that we can dump out, if you go and dump out that container, you get rid of the mosquitoes that are inside that container. It's a really important thing that we can do that not only helps us from getting bit, but if there are diseases, it can prevent diseases from being spread in the area as well. You actually beat me to that cuz I was gonna talk about that.
Canada	3	Scientist:	Let's start out and talk a little bit about insect life cycles, some of my favorite toys here, and I'm gonna ask people to tell me what kind of life cycle.

			If you guys know about insect life cycles, what sort of life cycle does this represent? Can you see these up close? Do you want to put that one on? Okay, all my favorite toys. I see a bunch of hands back there.
		Student:	Life cycle of a larva?
		Scientist:	Exactly. Yeah, this is a monarch butterfly. You guys can probably see very well that here we have some little eggs. Here we go, eggs and caterpillars. They would grow into bigger caterpillars. Eventually, they would go through—what's that called when they transition from a caterpillar to an adult butterfly?
		Student:	Metamorphosis.
		Scientist:	Of course it is. Right? This process, even though you're thinking, yeah, we already know this stuff, one of the things that is really important when we talk about mosquitoes is that, of course, you have to remember that mosquitoes go through that same process. Let me line them up here for you. These little toys, they represent the mosquito life cycle, so it would be the same thing. They start off with a bunch of eggs, a raft of eggs usually, and then from those eggs, hatch a mosquito larva. He larva goes through that same process of metamorphosis. It pupates, and then it becomes an adult.
Florida	4	Scientist:	We have three insects on the screen for you. Three different kinds of flies because mosquitos are a type of fly, but only one of those pictures is a mosquito. Which one do you think it is?
		Student:	The third one.
		Student:	I think it's the second one.
		Student:	Number one.
		Student:	I just say it's three because it's sucking something out of the skin.
		Scientist:	If you guessed the third one, you're correct.
		Teacher:	Listen, we're right.
		Students:	Yay!
Objective 2: List mosquito-borne diseases			
		Student:	What is mosquito-borne illness?
Pakistan	5	Scientist:	You want an—so basically mosquitoes can carry different pathogens. In the case of malaria, they carry the plasmodium, in the case of dengue, which you might know of in other countries near you, they're carrying a virus. Like I said earlier

			with West Nile virus, that's obvious they also they were carrying a virus.
Canada	6	Scientist: Student: Scientist:	What kinds of things do you think people might want to study here about mosquitoes? Maybe what diseases they carry or how they produce or something. Yeah, absolutely. What diseases they carry, that's a really important question, and a lot of researchers are very focused on that, especially here right now in Florida. We're in a fairly tropical place. It's actually subtropical here in this part of Florida. Let's see, in mid-80s today, so it's definitely full-on mosquito season right now. Every time somebody's walking outside around here, we've got a lot of mosquitoes around.
Objective 3: Summarize mosquito-borne illness prevention and protection/control methods			
Pennsylvania 2	7	Scientist: Student: Student: Student: Student: Scientist: Student: Scientist:	What can we do to prevent mosquitoes from living and developing around our home? You could get different plants mosquitoes don't like. There are some, like citronella. Citronella has some repellant. You could keep it cold in your home. You could block mosquitoes from getting in. In water. What do you do with the water though if you don't want mosquitoes? You dump it out You dump it out, right. I'm sure you guys have toys around your house, right? Do you guys ever play outside and leave your toys outside or something? Water can collect in those different types of toys, so what you have to do is you have to go around your house and look for any place where water is collecting. If there's a tarp in your yard or a bucket, or maybe a slide or something like that, where the water is just pooling, you want to make sure that you dump out that water so the mosquitoes can't develop in it. Does that make sense?
Pakistan	8	Student: Scientist: Student:	Ma'am, why we don't make vaccines for malaria? Well, malaria—are you saying you don't have a vaccine for malaria? Ma'am, just polio, why don't we have vaccines for malaria?

		Scientist:	Basically, there is a vaccine for malaria. It's just not as—there is not a vaccine. There's some medication that you can take that might prevent you from getting malaria. I don't know. I know people take that when they're gonna be going traveling to somewhere that has malaria, but I guess maybe where you live, it's like you're not gonna take that medication all the time.
Canada	9	Scientist: Student: Student: Scientist:	What do you think you can do to reduce the mosquitoes around your home? Anybody have an idea of something you could do to actually reduce the number of mosquitoes? Use bug spray My duck eats mosquitoes. Your duck eats mosquitoes. You know what? There are all kinds of things that eat mosquitoes.
Pakistan	10	Scientist: Student: Student:	What are some methods of control that you use locally to prevent yourself from getting bit from mosquitoes? Mospel, ma'am. Using a Mospel. Mosquito nets.

The scientists engaged with the students and the students asked the scientists questions about the mosquito life cycle, habitats, and physical traits (Excerpts 1-4); mosquito-borne diseases (Excerpts 5-6); and mosquito- borne illness prevention and protection control methods (Excerpts 7-10).

Discussion

The *Scientist Online* format via Skype in the Classroom was a new approach to EFTs for the Streaming Science platform. The Science of Mosquitoes pilot program resulted in a number of positive aspects and learned experiences. A positive attribute of the Skype in the Classroom format was the opportunity to provide a more individualized format where the students in the classroom got more of a one-on-one experience with a scientist. This also allowed the scientists the opportunity for more engaged interaction with the students. The students had a positive level of agreement in almost all of their thoughts about the EFT program. The transcribed Skype calls demonstrated students' thorough engagement with all objectives of the EFT program.

The attendance of international classrooms was a learning experience for the Streaming Science team as it was unexpected that international audiences would be interested in participating. There were two classrooms outside of the United States present throughout the five EFT programs. It was interesting to work with the international classrooms as their locations and experiences were different, as compared to the scientists and to the participating United States classrooms. More specifically, the classroom in Pakistan had different experiences with mosquitoes. Dumping out standing water to reduce the ability for mosquitoes to breed, lighting citronella candles, or spraying bug spray were methods of mosquito control the scientists were prepared to discuss. However, methods of control for the students in Pakistan included sleeping

with bug nets around their beds at night and the use of Mospel liquid. The scientists tailored content to be relevant for the international classrooms to the best of their ability.

As a result of the COVID-19 pandemic, social distancing, and schools and universities moving teaching and learning to online environments, the need for and usage of EFT programs has grown. PK-12 schools and parents quickly searched for emergency remote teaching tools. In the spring 2020 semester, the Streaming Science offered a program titled *Scientist Online: The Water Around Us* with learning objectives focused on the connections between plants, animals, and human interactions in water ecosystems. The EFT featured UF water scientists and originally, schools across the country registered to participate via the Skype in the Classroom platform. *The Water Around Us* EFT program was supposed to mimic the *Scientist Online* format discussed in throughout this article. However, most of the teachers quickly cancelled their registrations, when physical school campuses closed due to COVID-19. The Streaming Science production team and participating water scientists also transitioned to work from home environments and moved the EFTs to a modified Facebook Live format, so that teachers, parents, and youth could easily access the programs from out-of-school, home environments with their personal computers and mobile devices.

Recommendations

There are a number of recommendations the Streaming Science team proposes to ensure a quality EFT experience for scientist and/or subject matter experts, participating students, and professional communication producers. The nature of the Skype in the Classroom sign-up process allows teachers to sign-up to participate in the EFT but not follow-through and actually participate in the EFT. The Streaming Science team followed up with the schools before showing up to the lab to host the EFT to ensure the classroom was going to participate. Confirming participation saved time for both the scientists and the agricultural communicators and is strongly recommended if pursuing this EFT method.

Skype in the Classroom and the Microsoft Educator platform allows teachers from all around the world to join. While this is a great opportunity for domestic and international students alike, it may cause scheduling conflicts due to time differences. Ensuring the teachers are aware of the time difference in the beginning is recommended as the Streaming Science team faced some difficulties scheduling with international classrooms.

There is high potential for a wide range of diversity in learners across classrooms. Agricultural communicators and scientists could prepare different versions of the program to effectively engage with the different audiences. This may include elementary, middle, and high school versions of the program with corresponding visuals and terms. Catering to international audiences may require additional diversification. The EFT host team should consider working with the teacher of the international classroom to ensure students are getting the most out of the EFT experience. Accommodations may include a translator, translated materials, or content specialized for their specific geographical location.

The *Scientist Online* format, in addition to other EFT formats, have been communicated to both science teachers and agriculture teachers in the state of Florida as a tool for them to use as supplemental activities to their classroom curriculum. The science teachers appeared to be more receptive to integrating and utilizing this type of educational program in their classrooms, as compared to the agriculture teachers. The possible barriers to agriculture teachers participating

in EFT are unknown. However, contacting agriculture teachers in the state may assist in reducing any barriers that may prevent them from participating.

A team of people is required to organize and deliver an EFT program like the one discussed in this article. Team member roles to be considered include keeping registration organized and keeping in contact with teachers, content developers, and technology/equipment managers. It is recommended to have scientists or subject matter experts play a large role in developing the content and focus on delivering the content for the EFT. The agricultural communicators should focus on the organization of registration, facilitation of the EFT, developing learning objectives, monitoring content quality, facilitation and development of a Teacher's Guide and related materials for classroom teacher training to smoothly implement the program, assisting scientists or content experts with comfortability in delivering the program, and equipment testing and operation.

Conclusion and Future Plans

Overall, the pilot of the *Scientist Online* EFT format established a solid foundation for the Streaming Science team to build upon for future *Scientist Online* EFTs. The Skype in the Classroom platform was effective in bridging the gap between students in classrooms world-wide with scientists in a university lab setting. Additionally, this EFT experience allowed an opportunity for social scientists and applied scientists to work collaboratively and build upon each other's strengths to deliver an educational program utilizing mobile communication, outreach tools, research knowledge, and skills. Streaming Science will continue to host *Scientist Online* EFT programs into the near future every spring (i.e., around March/April). The topics will rotate to afford students the opportunity to engage with scientists who specialize in different content areas.

References

Adedokun, O. A., Parker, L. C., Loizzo, J. L., Burgess, W. D., & Robinson, J. P. (2011). Factors influencing participant perceptions of program impact: Lessons from a virtual fieldtrip for middle-school students. *Journal of Extension, 49(*6). Retrieved from https://www.joe.org/joe/2011december/a8.php

Bareja, B. G. (2019). What is agriculture? Definition of agriculture. Retrieved from https://www.cropsreview.com/what-is-agriculture.html

Cassady, J.C., Kozlowski, A. & Kornmann, M. (2008). Electronic field trips as interactive learning events: Promoting student learning at a distance. *Journal of Interactive Learning Research, 19*(3), 439-454. Retrieved from https://www.learntechlib.org/p/24187/

eXtension. (2014). What is agriculture? Retrieved from https://articles.extension.org/pages/64505/what-is-agriculture

Food and Agriculture Organization of the United Nations. (2015). *Developing the knowledge, skills and talent of youth to further food security and nutrition*. Rome, Italy: The Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/3/a-i5024e.pdf

Greene, J. P., Kisida, B., & Bowen, D. H. (2014). The educational value of field trips. *Education Next, 14*(1), 79-86. Retrieved from https://www.educationnext.org/files/ednext_XIV_1_greene.pdf

Knapp, D. (2010). Memorable experiences of a science field trip. *School Science and Mathematics, 100*(2), 65-71. DOI: 10.1111/j.1949-8594.2000.tb17238.x

Loizzo, J. L. & Beattie, P. N. (Accepted). Self-study of a project-based graduate science communication course focused on electronic field trip development. *North American College and Teachers of Agriculture (NACTA) Journal*.

Loizzo, J. L., Harner, M. J., Weitzenkamp, D. J., & Kent, K. W. (2019). Electronic field trips for science engagement: The Streaming Science model. *Journal of Applied Communications, 103*(4). doi: 10.4148/1051-0834.2275

Microsoft. (n.d.). Microsoft education. Retrieved from https://www.microsoft.com/en-us/education

National Geographic. (2011). Agriculture. Retrieved from https://www.nationalgeographic.org/encyclopedia/agriculture/

Rudmann, C. L. (1994). A review of the use and implementation of science field trips. *School Science and Mathematics, 94*(3), 138-141. DOI: 10.1111/j.1949-8594.1994.tb15640.x

Sriarunrasmee, J., Suwannatthachote, P., & Dachakupt, P. (2015). Virtual field trips with inquiry learning and critical thinking process: A learning model to enhance students' science learning outcomes. *Procedia-Social and Behavioral Sciences, 197*, 1721-1726.

United States Department of Agriculture. (n.d.). For educators and community leaders. Retrieved from https://www.usda.gov/youth/educators