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Let's stream! A beginners' guide to live-streaming scientific conferences

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ABSTRACT

Live-streaming conferences increases the participation of a diverse audience, help defray travel costs and overcome problems related to travel restrictions. In this article, we lay out tips for implementing live-streaming in scientific meetings. We also cover legal, ethical, and technical aspects implicated with live-streaming scientific talks. To write this article, we leveraged knowledge from our experience in organizing the symposium "Deciphering the Denisovans," presented at the 88th Annual Meeting of the American Association of Physical Anthropology (AAPA) in Cleveland, OH, in 2019, as well as literature on the topic.

1. GO LIVE!

The importance of scientific conferences for our development as scholars is immeasurable. As a venue for intellectual exchange, scientific conferences furnish the opportunity for presenting our research, as well as giving and receiving feedback. However, the costs for attending a scientific conference are sometimes prohibitive. Visa requirements and childcare are often an additional burden for conference attendees. As a result, conference attendance is often restricted to scholars of the host country, limiting the diversity of attendees, and potentially, also the breadth of academic discussions.

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As a possible solution to defray the costs with attending a scientific conference and increasing the participation of diverse scholars, we endorse the use of live-streaming and video-conferencing. By broadening participation, such initiatives enhance inclusion and promote wider accessibility. In addition to directly increasing diversity of attendants, live-streaming and video-conferencing also indirectly contribute to environmental quality by reducing carbon emissions due to long-distance travel and creates the opportunity to share science with the public beyond strictly academic contexts. Here we lay out tips for implementing live-streaming in scientific meetings -- meaning when conference talks are transmitted online to viewers who have access to a predetermined streaming platform. The same methods generally apply to video-conferencing as well. In addition, we also cover legal, ethical, and technical aspects implicated with live-streaming scientific talks. To write this article, we leveraged knowledge from our experience in organizing the symposium "Deciphering the Denisovans," presented at the 88th Annual Meeting of the American Association of Physical Anthropology (AAPA) in Cleveland, OH, in 2019[1], as well as literature on the topic[2-5]. The symposium celebrated the 10th anniversary of the excavation of the first known Denisovan fossil. We invited 11 speakers from 10 different countries and, for the first time in the history of AAPA, a symposium was live-streamed online for free (the symposium program can be accessed at this link https://meeting.physanth.org/program/2019/session09/). Talks were made available online for free, broadly to both the academic and non-academic audience. The session was one of the most attended during that year's meeting and, as of October 2019, the recording of the symposium was accessed by over 1600 people on AAPA's social media.

2. PLAN AHEAD

There are several aspects that will need to be considered before hosting a live streaming event, ranging from technical (equipment, platforms for live-streaming, internet connection, etc.), to financial and legal. In addition to the traditional tasks of organizing a symposium, the required equipment needs to be acquired well in advance and tested (see item 4 below). If you plan to raise funds for sponsoring the live-streaming event, you will need to consider extra time for the fundraising. Testing equipment also needs to be planned and performed in advance. For example, you should run mock-presentations to ensure the correct functioning of your live-streaming setup and to identify potential problems. Although we provide a list of equipment below, there may be some gadgets or utilities that the particular equipment in use requires. It may be worth checking

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with your institution if equipment loans through university libraries are possible. Alternatively, it may be possible to negotiate with the hosting organization the possibility of acquiring audio-visual equipment as part of their meeting contract. When video-conferencing speakers that are not physically present at the conference, schedule a mock-presentation with them a few days before your live event. Request them to be in the exact same location where they will be video-conferencing on the day of the conference, so that their lighting, camera, and internet connection can be tested. Last, if video-conferencing, be aware of time-zone differences.

3. DO IT RIGHT

Live-streaming conferences comes with legal implications related to privacy, intellectual property, and copyright. Before you start, you will need to make sure you understand the legal aspects of live-streaming to avoid unintentionally committing any infringement. We recommend that, before the event takes place, you ask the speakers whether they agree to be part of a broadcast and leave them the option to not be part of it. If they agree, it is advisable that you obtain their written consent. To write a consent form, we recommend consulting with the organizers of the conference, the responsible professional association, or the institution where the event is taking place. Beware that presentations also cannot contain any copyrighted material without permission. Moreover, it is also important that you notify the conference attendees (the audience) that the session is being recorded and that the content will be live-broadcasted. That can be announced before the session takes place, during the introduction, as well as in the conference program. Since specific laws may change across jurisdictions, it is of utmost importance that organizers consult with professionals who can assist with legal matters regarding, for example, copyright and use of image.

4. RESEARCH WHAT EQUIPMENT YOU NEED

Live streaming your conference requires that you become familiar with some basic pieces of equipment that ensure you will deliver high quality video and audio recording to the viewers. Figure 1 provides a schematic of the basic live video streaming equipment setup. Here we put together a list of essential pieces of technology that we found easy to set up for beginners (like us), who approached this new adventure for the first time. It is worth noting that we elaborated this list based on technology currently available. Encouragingly, there are plenty of video tutorials and guides online to help you build your live stream setup.

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· ***Camcorder.*** The most important piece of equipment for your live-streaming setup is the camera. Some important features to consider when looking for a camcorder are video resolution, zoom lens, image sensor and stabilization, bit rates and high capacity battery. Given our limited budget, we used a full high definition (HD) camcorder which captures images in 1920 x 1080 resolution. A 4K resolution or higher resolution camcorders will generate a clearer picture, at some additional cost. Finally, you might want to choose a camcorder that can accommodate an external microphone. Alternatively, you can connect your audio source directly into your computer.

· ***Video capture device.*** You will need this device to get the video signal from your source (i.e., the camcorder) into your computer. The choice of the video capture device depends on the signal format available as input. Assuming that you are using a full HD camcorder, the HD HDMI video signal outputted from the camcorder is directed into the video capture device through a standard HDMI cable. The video capture device automatically detects the input signal and converts it into a format that can be recognized by your computer (Figure 1).

· ***Streaming software and platforms.*** Once the video signal is recognized by your computer, a streaming software is necessary for sending it to a destination that supports and hosts the streaming, i.e., the streaming platform. Streaming software varies for features, such as supported streaming platforms, stability, operating system compatibility and cost. The choice will depend on the specific needs and budget availability. For our symposium, we used Open Broadcaster Software (OBS; https://obsproject.com), a popular, free, open-source streaming software. Similarly, the choice of streaming platform solutions will also depend on specific needs for the live event. After weighing features of the different services provided and cost, we opted to stream for free on Facebook Live (accessible on any browser, no Facebook account needed) so that the content would be available for free and accessible for anyone to watch and comment. Additionally, the type of format to be live-streamed also plays a role in the choice of the streaming platform. Format options are to live-stream (*i*) the image of the speaker giving the presentation, (*ii*) the slides of the presentation only, and (*iii*) the slides on full screen and the image of the speaker in the screen corner. In any case, the speaker can control the slideshow.

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· ***Other equipment:*** In addition to the equipment above, you must also have a computer (with the required software installed and tested), at least one SD card (in case you want to record the talks and make them available after the event), long cables (HDMI cables and outlet connectors), a tripod for the camcorder, and an ethernet cable. We recommend that you use a wired internet connection, to avoid interruptions of the live-stream, since Wi-Fi connection is often unstable. Make sure the venue has wired internet connection available.

5. PUT IT TOGETHER AND TEST IT

Once all the equipment is in place, we recommend that you test it well in advance, possibly at the event's location. You might attempt to re-create the live conditions of the event that you plan to live-stream, such as, for example, speakers's setup, sound, lighting, and internet connection. We also recommend that you schedule a briefing with your speakers and conference staff on the day of the event, so that everybody can become familiar with the program and the live-streaming technology.

6. HAVE A BACKUP PLAN

Should you be prepared for a live-streaming catastrophe? Definitely, yes. There are many things that might go wrong with your live-streaming event. Pre-recorded videos of the speakers' presentations are a good backup strategy, should any issue arise on the day of the event. We recommend that you request your speakers to prepare their pre-recorded videos and share them with you at least two weeks prior to the live-streaming event. Ask them to save the videos in different file formats to avoid software incompatibilities. Basic pre-recorded videos can be prepared using Microsoft PowerPoint and a microphone. More sophisticated settings might include video-recording the speaker's talk using a camcorder in a seminar room. You might want to test the videos on all the computers that will be used on the event's day. Moreover, the availability of pre-recorded videos will allow you to create an archive of the speakers' presentations that can become available, for example, to be hosted on the conference website.

7. ENGAGE WITH THE ONLINE AUDIENCE

There are many different ways one can engage and connect with the online audience. In our experience at the AAPA's, we put efforts into promoting our symposium on several social medias,

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in the months preceding the live-streaming event. As a result, we obtained interest and participation from a wide and diverse online audience, including academics and non-academics. To engage with the members of our audience during the live-streaming, we built a Q&A session at the end of the talks and gave the opportunity to the online audience to ask questions to the speakers, by posting comments on Facebook Live and Twitter. We created a unique hashtag (#decipheringthedenisovans) to make it easier to gather questions. We recommend having a moderator to monitor your event's online presence, track views and comments, collect questions and direct them to the speakers. The Q&A session is an important venue for interacting with your audience and for exchange of ideas, we recommend that you devote at least 15% of your total event duration to it.

8. CONCLUDING REMARKS

It is now becoming more common to have symposia, sometimes a whole conference, live-streamed and recorded, and made available online afterwards. This could be seen not only as a new way to organize a scientific conference, but rather as an academic product. Such initiatives greatly increase the participation of a diverse audience, help defray travel costs, overcome problems related to visa restrictions, and transform the conference environment. Some professional organizations and institutions, for example, offer the possibility to access the live-stream and/or the recording of their conferences and events for a registration fee. Diversity is a huge benefit for academia as it inspires innovation and creativity. Live-streaming scientific talks for a wider public may expose both the scientific community and society to new ways of thinking.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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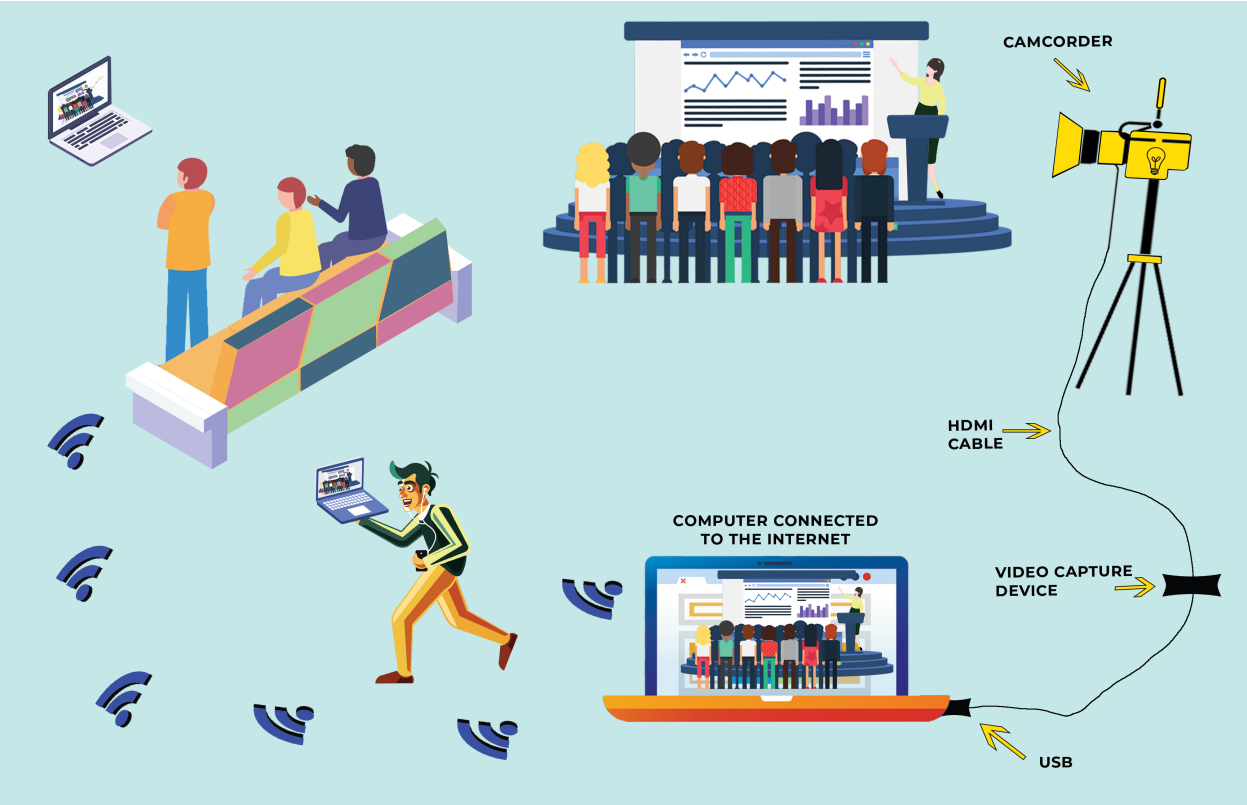

Figure 1. Schematic of the basic live video streaming equipment set up. Illustration by Moema Umann.