What ATS Scholar Looks for in an Educational Video

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In the Spring of 2020, the global coronavirus disease (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) massively disrupted both clinical care and medical education. Because of the need for physical distancing owing to COVID-19, there has been a dramatic rise in remote teaching and learning that has occurred throughout medical education, with an increased focus on developing high-quality online medical educational resources (1). Video-based educational resources were already a major component of medical education prior to SARS-CoV-2, but the need for developing synchronous and asynchronous web-based teaching materials has further increased the role of videos in teaching medical learners.

The American Thoracic Society (ATS) is a proponent and source of high-quality medical education videos in Pulmonary, Critical Care, and Sleep Medicine (PCCSM) since having created the Best of the ATS Lecture Series (BAVLS) in 2016 (2, 3). BAVLS served as a site for innovative, creative, and effective medical education videos made by ATS members. Members could submit videos throughout the year, and the videos were reviewed and evaluated by a panel of medical educators who selected the top three videos for special designation at the ATS International Conference.

With the creation of ATS Scholar in 2019, BAVLS has been retired, and ATS Scholar now serves as a peer-reviewed destination for medical education videos. As opposed to BAVLS, ATS Scholar does not adhere to a cyclical annual schedule characterized by judging and selecting the top three videos of the year. Videos submitted to ATS Scholar are evaluated based on quality, content, and design. Although the quality requirements for videos are described in the journal’s Instructions for Contributor (https://www.atsjournals.org/journal/ats-scholar/instructions?=#videos), the other evaluation criteria are founded on best practices in medical education and warrant further consideration.

Content

As an education journal for the PCCSM communities, videos submitted to ATS Scholar should be focused on content related to these fields. Thematically, the content of videos should describe, explain, contextualize, or teach about a medically related concept, although content could

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range widely between videos, from first principles of physiology, to intricacies of pharmacotherapy, to clinical practice skills such as clinical reasoning, critical thinking, and procedural skills. The breadth of potential topics for video submission mirrors the breadth of PCCSM and reflects the creativity of our community.

When planning and developing a video, contributors should anticipate that their video will be used by medical learners from around the world for asynchronous, autonomous education. All videos submitted to ATS Scholar should be designed and developed with the intent of teaching students, residents, interprofessional learners, scientists, and practicing clinicians.

Design

When designing videos, contributors should keep best practices of modern educational theory and practices in mind. Principles of cognitive load theory and active teaching practices are particularly pertinent considerations when designing educational videos.

As a simplified overview, cognitive load theory describes the transient nature of sensory memory and proposes a theoretical pathway in which sensory stimuli are subconsciously filtered and selected for temporary storage and processing in working memory before either being discarded and (ultimately) forgotten or moved into long-term memory (4). Working memory is considered to have limited processing capacity, such that learners have to be selective about what information from sensory memory they need to actively pay attention to while learning (5).

Cognitive load theory describes three components of learning: intrinsic load, germane load, and extraneous load (Figure 1). Intrinsic load is dependent on the topics and concepts being studied and the connectivity and complexity of the subject being studied (6). For example, learning the names and acronyms of the various types of interstitial idiopathic pneumonias has a lower intrinsic load than truly understanding the pathophysiologic mechanisms and clinical implications of esophageal balloon measurements in patients with acute respiratory distress syndrome. Germane load is defined as the level of cognitive effort needed to achieve a learning outcome.

**Figure 1.** Active teaching strategies to address components of cognitive load in educational videos.
or how much mental effort a learner needs to expend to incorporate new knowledge (7). Finally, extraneous load is inefficient or ineffective cognitive effort that a learner expends in processing information that is not relevant to the teaching points or topics from a lesson or video (8). Extraneous load has important implications for how educators design and organize teaching sessions or resources.

Active teaching and learning describes learners engaging with material to answer questions or work through problems rather than simply passively being exposed to topics or concepts through a unidirectional transfer of information. These theoretical and practical considerations have an impact on and implications for developing educational videos (9, 10).

Although a video does not allow for synchronous interaction, other active teaching and design-based learning strategies designed to address cognitive load and other aspects of evidence-based teaching can be incorporated into well-designed educational videos (Figure 1). Videos that provide viewers opportunities to apply knowledge are more effective in developing durable learning, as opposed to videos that only passively transfer information to learners. Incorporating interactive questions into videos and asking viewers to pause the video to answer questions or work through problems before continuing is one effective means of converting a video from a purely passive experience into one in which the viewer has some accountability for the content and topics (11, 12). Interactive features, such as links or QR codes that lead to online simulators, interactive clinical scenarios, surveys, or other interactive resources, can be provocative and engaging ways to extend learning and application of knowledge beyond the time when the learner is viewing the video. These strategies can also provide direct feedback to the video creators to better understand who is watching the video and viewers’ comprehension of the content. Other strategies, such as providing guiding questions to learners during the video or packaging videos with “homework assignments” to engage learners after they are done viewing the video, can serve to reinforce lessons learned and increase the likelihood of developing durable knowledge and understanding.

With regard to the implications of cognitive load theory on designing videos, some quality parameters, such as a strict 10-minute limit for video submissions, reflect the importance of not overwhelming working memory (13). Other design considerations to consider to reduce cognitive load include strategies such as using signaling to anticipate and highlight important information, including using out-of-video text and/or highlighting key concepts with color, contrast, or other effects. Chunking information in videos into short subsegments of 3–4 minutes can help learners digest information more effectively and keep from overwhelming working memory. Avoiding unnecessary, extraneous content such as background music or busy visual stimuli can help to streamline sensory input and allow learners to better decide which content warrants attention from their working memory. Too much visual and/or audio stimuli can result in learners being distracted and unsure of what to focus on and increase the risk that they may miss or dismiss key points (14).

Keeping these strategies in mind when planning and designing an educational video will help contributors ensure that the videos that they submit to ATS Scholar as well as other educational venues are as effective and valuable as possible for viewers.

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