ETHICS OF SOUND QUALITY IN ONLINE TEACHING, LEARNING AND CONFERENCING: PERSPECTIVES GAINED DURING THE COVID PANDEMIC

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Abstract

Recent developments in using audiovisual software for teaching and learning are very challenging in terms of achieving a minimum of audio and visual quality. This article will focus on the correlation between visibility and audio quality of content transmission, as well as ways of making specific experiences in choosing tools and publicly accessible methods preservable.

Each expert provides their personal and professional experiences concerning audio processing applied to an online learning environment, the challenges of teaching singing online, and the audiovisual preparation of online conferences.

The experts work in the audiovisual archives field and are all connected through their work advocating for small-scale archives in Asia. They are frequent contributors to the IASA Journal. In this article, their most recent perspectives with ethics in sound quality will be the centre of the exchange of ideas.

KEYWORDS: ethics, sound quality, social practice, online learning

Audio Processing Applied to an Online Teaching Environment

Ahmad Faudzi Musib

As a Senior Lecturer in the field of Audio Engineering and Sound Preservation, the author has observed the difficulties that students and teachers have encountered in adapting to online learning due to the pandemic. The sudden transition to fully online learning at Universiti Putra Malaysia (UPM) has had a significant impact on educational approaches and experiences, particularly in the field of audio engineering and sound preservation. Students and teachers had to suddenly cope with education in a home environment which could be disruptive and distracting, and many students also faced technological limitations that further exacerbated online classes. Courses that rely heavily on audio and video materials faced additional technical challenges due to the introduction of another layer of technology: videoconferencing software.

This section aims to explore the challenges faced by both students and teachers in adapting to this new mode of education and to suggest potential solutions to mitigate the negative effects of online learning. The specific aim is to answer the research question of what factors should be considered in determining whether an audio format is suitable for use as a means of transmission and streaming for online teaching to achieve at least a minimum desired level of audio and visual quality. By investigating the various technical aspects of audio formats, such as dynamic range, clipped samples, and DC offset, the effectiveness of different file types, including wav, mp3, and aac, are examined in the specific context of online learning. Ultimately, this research aims to provide a better understanding of the optimal audio formats for online teaching to ensure that students and teachers can have a seamless and productive learning experience.

In the 2020-2021 academic year at UPM, I taught the course "Studio Recording Techniques," which has been part of the required curriculum for students in their fourth semester of the Bachelor of Music programme for over 20 years. However, due to the COVID-19 pandemic, the course was shifted to online instruction, which presented specific challenges.

One of the main technical considerations in planning the online shift was lecture materials. Sound quality was a major concern, as pre-production of class materials, which were mainly in multitrack stereo format, needed to be converted to a suitable file compression for online distribution. Additionally, recording demonstrations presented a challenge as they were recorded via line-in, for example demonstrating an audio recording of an electric or acoustic guitar using various stereo microphone techniques, such as the Mid-Side technique, which involves very close placement of two microphones.

Another technical consideration was transmission issues. Stable connections and sufficient bandwidth were required for uploading and live streaming with the students. Audio streaming presented a challenge as the signal was streamed from several different places, which required suitable blending between audio and visual. These issues impacted the overall effectiveness of the online instruction of the Studio Recording Techniques class, which prompted the need for further analyses of the data.

Internet speed test profiles were collected by the students from various cities in Malaysia during the COVID lockdown. The tests were run to determine the quality of the internet connection in different locations, and to identify potential issues that may arise during online learning. Some of the internet speeds recorded were fast, while others were slow (Figure 1). Slow internet speeds caused by unstable connections and low bandwidth can result in stuttering and bubbly sound during online lectures. With such a range of internet speeds, it is important to consider the file format used for transmission to ensure a smooth delivery of online lectures and streaming of sound files.

Figure 1: Speed test profiles available to the students (Ookla Speedtest: https://www.speedtest.net/).

One lecture from the course focuses on the electric guitar. Peripheral equipment connected to the use of an electric guitar is addressed, including the stomp box and multi-effects pedal, and guitar technique. In addition to describing some fundamental aspects of the electric guitar and its electronics, the lecture includes sound examples derived from the five types of pickup selectors.

The pickup selector switch is used to turn several pickup combinations on and off. For instance, a dual-pickup guitar's selector switch would enable both simultaneous use of both pickups as well as individual control of each pickup. This switch is found on electric guitars that have five different pickup configurations. The pickup selector can be used to turn on the neck, middle, and bridge pickups individually or in various combinations. On a Fender Stratocaster, there are two tone controls that regulate the tone's brightness. The center pickup is adjusted by the lower tone control, while the neck pickup is adjusted by the top tone control. The tone produced by the pickups depends on where they are placed. Pickups placed closer to the guitar's bridge produce a bright, snappy sound, while pickups placed closer to the neck produce a mellower, warmer sound.

Sound quality issues can affect the demonstration of different pickup configurations and their respective sounds. Similarly, transmission issues can lead to sound streaming problems, which would further affect the perception of the different pickup configurations and their respective sounds. Important aspects of the electric guitar sound may be lost. By analyzing the sound samples with an amplitude statistic, the differences in dynamic range, DC offset, and clipped samples can be identified and used to determine the optimal file format for the desired listening experience. Figure 2 illustrates the results of the analysis of three different file formats: wav, mp3 and aac.

		WAV		MP3		AAC	
		Left	Right	Left	Right	Left	Right
1	PEAK AMPLITUDE:	-1.92 dB	-1.92 dB	-1.96 dB	-1.96 dB	-1.94 dB	-1.94 dB
2	TRUE PEAK AMPLITUDE:	-1.92 dBTP	-1.92 dBTP	-1.96 dBTP	-1.96 dBTP	-1.92 dBTP	-1.92 dBTP
3	MAXIMUM SAMPLE VALUE:	26258	26258	26140.95	26140.95	26199.00	26199.00
4	MINIMUM SAMPLE VALUE:	-16180	-16179	-16165.98	-16165.98	-16525.00	-16525.00
5	POSSIBLY CLIPPED SAMPLES:	0	0	0	0	0	0
6	TOTAL RMS AMPLITUDE	-15.09 dB	-15.09 dB	-15.12 dB	-15.12 dB	-15.06 dB	-15.06 dB
7	MAXIMUM RMS AMPLITUDE:	-12.56 dB	-12.56 dB	-12.55 dB	-12.55 dB	-12.54 dB	-12.54 dB
8	MINIMUM RMS AMPLITUDE:	-87.75 dB	-87.63 dB	-88.79 dB	-88.78 dB	-85.83 dB	-85.78 dB
9	AVERAGE RMS AMPLITUDE:	19.44 dB	19.44 dB	-19.52 dB	-19.52 dB	-19.34 dB	-19.34 dB
10	DC OFFSET:	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
11	MEASURED BIT DEPTH:	16	16	32	32	16	16
12	DYNAMIC RANGE:	75.19 dB	75.07 dB	76.24 dB	76.23 dB	73.28 dB	73.24 dB
13	DYNAMIC RANGE USED:	75.00 dB	74.95 dB	76.20 dB	76.20 dB	72.95 dB	72.95 dB
14	LOUDNESS (LEGACY):	-13.89 dB	-13.90 dB	-13.86 dB	-13.82 dB	-13.97 dB	-13.97 dB
15	PERCEIVED LOUDNESS (LEGACY):	-8.10 dB	-8.10 dB	-7.03 dB	-7.03 dB	-8.05 dB	-8.05 dB

Figure 2: Class demonstration materials in three file types were compared and analyzed (Table by the author).

The wav, mp3, and aac Adobe Audition file types were contrasted and examined. All 15 points of examination were subjected to an amplitude statistical analysis, which reveals that values were varied. An amplitude statistic, which shows dynamic range, spots clipped samples, and records any DC offset; was used to assess the sound samples. The wav and the mp3 had negligible value differences (yellow), but the loudness analysis revealed the average amplitude (red), with a + 0.03 to + 0.08dB difference between the two.

DC offset refers to a constant voltage offset that is present in an audio signal. This offset can result in the signal not being centered around zero, which can cause issues with processing and playback. Clipped samples occur when the amplitude of an audio signal exceeds the maximum level that can be represented by the bit depth of the audio file format. When comparing the sound of an electric guitar in different file formats, the presence of DC offset and clipped samples can affect the perceived quality of the sound.

According to the analysis in Figure 2, the aac audio in the visual sample (blue) has a perceived loudness of + 0.05 in both the left and right channels, which accounts for the human ear's preference for middle frequencies and is acceptable for live streaming. The dynamic range values change slightly from the aac. The differences between the amplitude reading and the wav values are caused by visual compensation for the variations.

It is necessary to determine whether an audio format is suitable for use as a means of transmission and streaming for online teaching to achieve at least a minimum of the desired audio and visual quality. With the above-mentioned internet speeds of my students, I will continue to stream AAC with audiovisual samples and MP3 at 192 kbps with audio-only samples.

At 128-160 kbps, good encoders provide acceptable quality, and at 162-192 kbps, extremely good quality is attained. One major aspect of mp3 is that it is lossy, which means that it removes information from the input to save space. By modelling human hearing features such as noise masking, mp3 algorithms, like other modern encoders, ensure that the noise they remove are not detectable by human listeners. The significance of this is that it can result in significant storage space reductions while incurring little, if not non-existent, fidelity losses[1]. Prior to all these preparations, files of the best quality are also delivered to the students via Google drive link. These files are shared in order to preserve their full sound qualities.

Face-to-face learning has now given way to nearly 100% online learning in Malaysia, except for some necessary face-to-face meetings and hybrid forms of teaching. Online instruction is likely here to stay, and teachers will need to get familiar with its routines. Classes that heavily rely on audio and video demonstrations present unique challenges. Balancing streaming requirements and audiovisual quality can be difficult, but using publicly accessible tools to inform a data-driven approach can enrich online learning experiences. Now that we've had a few years to adjust, lessons learned from the initial lockdown period might be applied in a systematic way when teaching online in the future.

1 For more on this topic, see Gomez, G. and Sanchez, R., 2005. End-to-end quality of service over cellular networks. England, John Wiley and Sons, pp. 281-282.

Teaching Singing Online: Missing Vibrations and Missing Memory

Chinthaka Prageeth Meddegoda

Since 2010, I have been a lecturer on the theory and practice of Hindustani vocal music at the University of the Visual and Performing Arts (UVPA) in Colombo, Sri Lanka. I myself learned Hindustani music in North India, living there on and off for ten years and working as a school music teacher in international schools in Varanasi for two years. During my education in India and my first ten years of teaching at UVPA, I never experienced online music education as I do today, nor am I aware of any contemporary vocalists who were taught online. In order to articulate some ideas about the experience of online teaching, I will draw upon my own subjective experiences over the past three years.

The COVID-19 pandemic rapidly increased the normalization of virtual teaching environments, and educators had no opportunity to fully investigate or understand the pedagogical implications of this shift. Secondary and tertiary education systems in South Asia have adopted online teaching as an alternative method to teaching Hindustani music in person, hoping eventually to get back to 'offline normality'. Teaching and learning Hindustani vocal music online remain extremely challenging endeavours at present. Role models within the Hindustani music market and artistic arena like Rashid Khan, Kaushiki Chakraborthy and many others have been learning how to adapt their teaching methods to this new online environment, which previously did not play a role at all. They issue many short clips and explain their approaches in micro steps.

IT experts and software vendors tout myriad technical strategies to make online teaching successful even in areas such as music, dance, cooking, sports, or in clinical surgeries--subjects that were traditionally not taught through online means. But in actual practice, the pandemic has prematurely forced a digital turn to education, without regard to the loss of nuance in fields where oral tradition and physical cues are vital to knowledge transmission. Tech companies also fail to recognize digital divides: not everyone has equal access to the full technology of online videoconferencing platforms. Due to low bandwidth and economic concerns about data usage, many of my students do not have the luxury of turning on their cameras during instruction. Thus, nearly 90% of my teaching happens through audio transmission only.

From a teaching perspective, online teaching makes it difficult to monitor whether the student has learned the material correctly, if the student has listened to recordings of the work seriously, or even whether the student was mentally present during lessons. When I sing a particular raga, I recall how the teacher taught it to me, and remember his gestures and facial expressions. I was encouraged when I witnessed the satisfaction on the teacher's face when my performance improved. This emotional attachment to the teacher played a big role in increasing my motivation, and fostering this kind of relationship is inherently difficult in online learning environments. Teaching online with audio only, I am not able to show appreciation or dissatisfaction to the students through movement or facial expression. Lately, my students seem to be more concerned with passing an examination rather than enjoying interactions with me or savouring the experience of learning new music. How can a teacher be a role model to a student in an online environment?

An integral and historic premise of the Hindustani music tradition is that knowledge transmission is only possible from teacher to student in their immediate presence. In Sanskrit, this concept is expressed as *guru mukhi vidya*, which can be loosely translated

as "the science transmitted through oral teaching." Missing visuality makes it impossible to learn the facial and gestural expressions that are associated with feelings of the vocal renderings. The usual way of teaching this artistry includes moulding the way the student should behave, including posture, breathing support, physical gestures, and facial expressions. The artistic expression of a raga is deeply connected to the physicality of its performer. How can a student feel and transmit the artistic expression of a particular raga that the teacher meant them to feel? The expressions and gestures of raga singing are not fixed and cannot be explicitly taught, but individuals develop their instincts by emulating the teacher, whose delivery of sound together with body movements is inseparable.

Unfortunately, I have postponed refining the process of teaching musical nuances online, instead hoping for a return to in-person teaching. Online teaching is not widely liked or accepted by my students or by other teachers I know, as the flow of teaching is often disturbed, and it is difficult to achieve refinement of performance. However, online teaching is not likely to disappear completely, so it would be wise for teachers to explore potential improvements to their methods. The best approach currently is to incorporate high-quality recordings of fine performances into teaching materials, and to encourage frequent and attentive listening.

Online instruction of course has some benefits: namely time and money saved by not having to travel to a physical classroom. I have also explored the benefits of using sound and audiovisual materials in my class to enhance the students' understanding of Hindustani music. I have learned that sending recorded material can be very useful to my students, in addition to meeting them virtually. The students learn to train themselves by hearing recordings of the teacher's voice. I learned to be very careful while preparing recorded teaching material of my own singing, correcting myself when I realized some mistakes that I was making. I would then ask my students to record the music pieces that they learned through hearing my recordings, and to send them to me for evaluation. Students learned that hearing recordings of their own voices can prompt reflective learning. Thus, the extensive use of recorded material helped both parties. This basic method was convenient and effective without having to learn many complicated IT strategies.

Yet, choices in replay quality are a must. There is no way of choosing mono or stereo or high or low resolution in the online applications we are currently using. Many people—students, teachers, researchers and musicians alike—simply accept this bad quality design and lower their expectations. I feel that this is a step back in the history of recorded sound and that it can harm proper preservation. Therefore, I call for more research and affordable applications in this matter.

In this process, students and teachers produced many recordings, and more than 50 percent of them are going to be deleted. Mostly, the deleted recordings are various trials which they believed were not well done. To my knowledge, the finally chosen recordings have not been archived in any systematic way. Recently, I found that the uploaded recordings on the university's Learning Management System (LMS), are still retrievable. The LMS is a virtual server provided by the university to support teaching. It is basically an internet storage platform maintained by the University and it is highly insecure since the university management does not care about intellectual property status or the quality of the recordings that have been uploaded. Most learning materials including audio recordings have been uploaded to the LMS. There is also no assurance for the safety and sustainability of the uploaded materials, as the platform may be shut down

on short notice. Therefore, the LMS is not a suitable platform for the long-term storage or preservation of student recordings or teaching materials.

At the University of Visual and Performing Arts there is also the C. de S. Kulathilake Research and Archival Unit, which contains a collection of sound and audiovisual recordings displayed on shelves in the Faculty of Music. It is conceived as an archive, but it functions more like a listening room, and students and the staff are allowed to enter the room and listen to any recording after signing into the logbook. Recently the staff made a catalogue listing all recordings available in the room, but the catalogue lacks shelf locations of individual recordings, which makes them difficult to locate. Many of the original recordings are not digitized, so they cannot be used as part of online instruction. The management is not able to proceed with getting support from outside sponsors or donors; and it is an arduous and complicated process to change any university procedure or policies. The collection contains CDs and cassettes of popular songs, classical music, movies, documentaries, recorded television programs, and some fieldwork materials. However, copyright rules in using or referencing the latter mentioned materials are not clearly defined. Thus, the archival unit does not significantly strengthen any online teaching methodologies.

Another problem in online teaching is the administration practical examinations. Real-time student examinations via online tools were not allowed to staff or teachers. This is because some students may have bad internet connections which could affect the evaluation process, possibly causing further issues such as receiving student complaints. Therefore, the students simply upload their performances as recordings. Mostly the students use mobile phones to record and upload. The recordings may be in any available video format, so long as the teacher can visually identify the student. However, it is difficult to monitor whether the students perform compositions by looking at notations or by recalling or improvising. This uncertainty may lead to further restrictions, which is not an encouraging prospect.

Based on experiences during the COVID pandemic, Hindustani musicians in the future will surely be trained using sound and audiovisual materials and online instruction. However, I believe that in-person meetings will still be needed (Figure 3 shows the complex connections in this regard, illustrating the progression over time from those orally trained to those trained fully online). Nowadays, after the pandemic, teachers must work with classes composed of students with disparate levels of experience and training, which presents another striking pedagogical challenge.

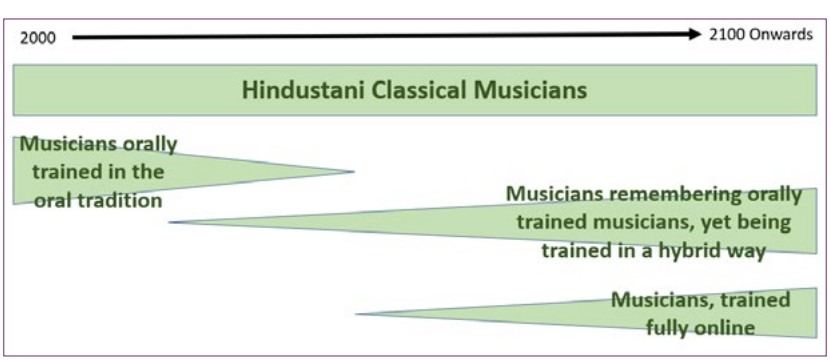

Figure 3: Prediction on the future training and education of Classical Hindustani musicians (illustration by the author).

Audiovisual Preparation of Online Conferences in Chinese Tertiary Education Institutions

Gisa Jähnichen and Xiao Mei

Attending online conferences is a vital part of tertiary education in China. Students are expected to contribute to and learn from other presenters, and they are required to attend conferences in both their primary and adjacent academic fields. Teachers must also attend conferences to fulfil continuing education requirements. In some academic fields, conference attendance even replaces lectures or readings. While it is commonplace in the West for universities to host conferences, there are also many other professional organizations, corporations, and specialized institutions that fill this role. In China, however, tertiary education institutions are the primary organizers and hosts of academic conferences. For several years and predating the Covid pandemic, these conferences have been also held online in China.

Chinese tertiary education institutions hire staff and admit students to academic programmes based on their professional expertise or qualifications in a specific field. Scholars in musicology or performing arts disciplines are not hired based on their proficiency with online technologies like videoconferencing software. However, it is undeniable that the organization of a successful online conference depends not only on knowledge of one's own academic field, but it also requires specific technical skills that range from managing streaming audio and video content; producing on-screen subtitles and translations for multilingual events; ensuring reliable and equitable conference access; providing ways for the audience to engage; and dealing with countless technical issues that arise during the event.

Conferences have traditionally been organized and run by post-graduate students, who are learning by doing and are, therefore, inexperienced as event managers. Online conferences add a layer of complexity that is difficult to manage with limited time and resources. There is usually insufficient time to consider aspects of video or audio quality, although these factors can have an enormous impact on the conference experience. When the Covid pandemic began and teaching, working, and conferencing were all forced to shift to a completely online environment; the awkwardness and lack of efficiency caused by technical issues became a familiar experience. There was even a humorous meme that was shared beginning in September and October of 2020, comparing virtual meetings to seances (Figure 4).

Figure 4. "Zoom meetings are modern seances" meme. Burgess Watson, Tom [@Tburgeswatson]. Twitter, 19 October 2020, https://twitter.com/Tburgeswatson/status/1318259532993355776.

Technology has advanced rapidly, and even in remote areas of China, internet speeds are very fast. Therefore, it is difficult to blame low bandwidth or poor connectivity on technical problems that occur during online conferences. If a strategic distinction between conference "content" (the spoken papers, slide presentations, or panel discussions) and the production of the online event itself is made during planning, organizers can learn to avoid much of this technical fumbling. The selection of experienced and competent chairs and moderators is even more important for an online event than for in-person conferences: staying on topic and on schedule is vital. Assigning separate conference workers to focus on managing the technical side of the online conference is also a good strategy that will allow smoother online conferencing. Finally, students who organize conferences should be trained not only on their academic subjects, but should be trained by their institution to prepare and deliver online conferences successfully.

Recordings and/or slide decks of conference presentations are deposited into the institutional repository of the host institution. Conservatories, performing arts programmes, and musicology departments at Chinese educational institutions often present original research via presentations, which are then referenced by other scholars in their own research. This makes the quality of the archived presentation even more significant, as it can be used as the basis of further academic study and research.

Problems arise when audio and video examples are of poor quality or are not formatted properly. During a live presentation, students might miss important details and consequently suffer academically. There should be clear requirements for archiving conference presentations to ensure the transmission of knowledge for future viewers.

Audio and video clips should always be embedded directly into the slide deck. A link is not sufficient, since the content could disappear and then leave a gap of context. If referenced audio and video content is important, it should be carefully preserved along with the words of the delivered paper. Auxiliary audio and video content that is part of a presentation should also be presented, and later saved, in formats with high fidelity, so information is not lost.

Finally, whenever audio and video are referenced in an online conference presentation, credit must be given to the authors or creators of the source material. This is often overlooked in Chinese online conference presentations, and also when presenting abroad. It is poor scholarly practice to ignore issues of intellectual property, but it can also hamper anyone trying to use the material later for academic research or study.

Participation in international conferences

In addition to the aforementioned issues, Chinese participants in international online conferences face another set of problems that are due largely to geopolitical issues. These concerns merit separate mention, particularly as international professional associations like IASA have a growing membership in China. In order to fully include all members in online conferences, certain technological challenges need to be navigated.

Due to the "Great Firewall," China has no legal access to any Google product. Other countries, including Iran, face similar restrictions. Google products are often used as elements within other videoconferencing platforms. Though it is currently accessible in China (as of June 2023), Zoom has been restricted several times in the past and may be again, based on decisions made by various states. These technological divides force Chinese participants to make an uncomfortable decision between following the law and participating in an important conference. Even if someone is willing to try to

sidestep the firewall, VPNs do not always work. In the event of worsening diplomatic relationships, Chinese participants could face isolation from the international scholarly community, which could lead to gaps and compartmentalization in knowledge dissemination and discourse across the globe. International conference presenters should strive to locate technologically neutral platforms that do not force participants to supply personal data, which could jeopardize their standing in their home country, or make attendance unduly difficult or complex.