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Guide To Improving Online Teaching And Audio Quality In Zoom

This article is meant to serve as a guide for CC teachers in both improving their online teaching studios as well as preparing students and their families for their online exams from their homes. Following are logistical considerations that will help exam candidates improve their exam experience, especially the quality of their audio using the Zoom platform. We are relying on teachers to educate families and CC is here to support you. Please send your questions to derek@conservatorycanada.ca

This article will be updated over the coming weeks as the technology evolves and as we find and learn of better solutions.

Why Zoom?

The Zoom online conferencing platform has emerged as the most preferred option for online studio music teachers. CC is recommending using Zoom for all online exams during the COVID-19 pandemic for the following reasons:

- It allows for audio settings to be adjusted that eliminate the auto volume adjusting that all platforms perform. All platforms (including FaceTime, Skype etc.) auto adjust or compress the volume making louder sounds quieter and quieter sounds louder. This inhibits us from hearing expressiveness in the form of dynamic changes. There is currently no way to avoid this in FaceTime or Skype, but Zoom gives us a workaround, using laptop or desktop computers.
- Most teachers are already using Zoom with their students. This should provide easier setup for examiners connecting with students on exam day. Students will already be familiar with logging in, being in the “waiting room” and using a password for security protection.
- There is potential for screen sharing with the examiner for sight reading and keyboard skills tests. A tablet connected to the meeting as a second device could facilitate this more easily, but is not essential. We will be providing more instruction on this component after we undertake more research. We will not be providing skills tests to candidates in advance by email.

- Although there have been security issues with Zoom, these have been alleviated by allowing for a password protected meeting as well as a waiting room where participants can be screened. CC online exams will be using both the Zoom password and waiting room features to secure the online environment for all students.

We are asking teachers to work with students in preparing exam candidates by familiarizing them with Zoom, including working out the best audio settings, camera placement, and other exam protocols.

We do not expect final results to be perfect nor do we expect families to go outside of their realistic means to address this. Everyone will have different thresholds and needs. Students taking an exam at the grade/level 1-3 will have different needs than a student attempting grade/level 8-10. Examiners are all experienced at teaching online, and have developed strategies for hearing and assessing what is implied by students while hearing less than ideal audio.

Zoom Audio Settings

By experimenting with the audio settings within Zoom, students can work with their teachers to decide on the settings that best capture and transmit their audio. The goal is to be able to hear the intended expressiveness, including dynamic and colour changes as well as possible. These settings are only fully supported on laptop and desktop computers (both PC and Mac), but not on mobile devices such as tablets and smartphones. For this reason, laptop computers are the preferred option, although not required. There are some cases where the best option may be the smartphone or tablet. Our recommendation is to experiment with students over several lessons until audio quality is improved, using the following ideas.

While logged into a Zoom meeting lesson, teachers can guide students through the following settings on a laptop computer. These settings need to be changed on the student's computer for teachers and examiners to hear them differently. They should also be changed on the teacher's computer for student's to hear you differently.

- Audio settings are found in the lower left corner by clicking the up arrow next to the mute mic button. Select "audio settings" from the bottom of this menu.
- Inside the audio settings box, start with the checkbox in about the middle that says "automatically adjust volume," and *uncheck* that box. This begins to stop Zoom from compressing audio into a narrow range, however there are additional steps below.
- There is a mic volume slider right above this check box that needs to be adjusted to an optimal level, depending on the student's computer, microphone, instrument and room they are in (this we will call the "environment"). If the slider is set too high, the student's audio will distort. If it is set too low, they will not be heard. It is more common to need to lower this volume, however we have seen it need to be set anywhere from 30 - 100% of its min/max setting. Have the student start at 80% (these are only approximate

percentages, they are not given in the app) and lower in 10% increments, playing for you between each setting to determine the best place to start. Keep in mind that it may need to be raised from 80%. You should now start to be able to hear dynamics more easily. It is normal to revisit this setting at subsequent lessons until you arrive at what you feel is the best overall setting.

- Next, click the “advanced” tab in the lower right corner of the audio settings box.
- At the top of this page, have students check the box “Show in-meeting option to enable original sound from microphone.” This stops Zoom from filtering or compressing audio from the microphone further.
- Exit from the audio settings box and come back to the regular meeting screen.
- Students will now see a new option at the top left of the screen to toggle “original sound” on and off. Students need to broadcast their audio in “original sound”. Thus, the option should read “turn off original sound” during the music lesson - indicating that original sound is currently being used.

These audio settings tend to stay fixed between meetings on the Zoom app and will give students the best chance at being heard expressively during their performances. These settings should be reviewed regularly to make sure they have not changed between lessons or before the exam. There is now an option to “turn on original sound” on mobile devices (tablets and smartphones) within the Zoom app, however we do not hear any appreciable change in performance expressiveness compared to what laptop computers can deliver. Here is a link to a helpful video tutorial explaining some of these settings:

https://networkphil.com/2020/03/23/optimize-zoom-audio-settings-for-a-remote-music-lesson/?fbclid=IwAR2I4V1qDVu1fjWgHiCI-Wxa4YT68G5vnrgeWNBOW3AKxr8jG37KJA2SO_Y

It is ok for students to use a mobile device for an exam, if that is their only or best option. Their ability to be heard expressively may be inhibited somewhat, which may be suitable for lower grade levels. Students in higher grade levels should understand the limitations that mobile devices carry, and can discuss the options with their teacher. In some situations, a newer iPad may actually give better results than a laptop that is many years old, depending on the microphone and other environmental factors. It is best to experiment to find the best solution for each student.

It is conceivable to combine two devices to capture audio from a laptop (enabled with original sound settings), with an iPhone set aside a keyboard to capture video with its superior camera. Students may also choose to use an iPad or tablet to share screens with the examiner for the sight reading or keyboard skills tests. More information will follow on how these tests will be executed, but students will not be able to view the tests before the actual exam time. Due to the volume of exams, we will not be able to send the skills tests by email in advance.

Internet Connection Speed

Ensuring that teachers and students are maximizing their connection speed is the most important factor in improving audio quality, but making changes is not as easy as working with audio settings in Zoom. You likely already know which of your students have weaker connections: the audio and video is often interrupted, the video can freeze, you have trouble hearing the student's music or what they are saying, or the connection fails.

We recommend that you take care of diagnosing your own connection issues first, work with Zoom audio settings second (both yours and students), and then approach families about solutions to improve their connectivity. Testing connection speed using a simple online speed test is the best way to diagnose connectivity speed. A simple speed test can be conducted by clicking "Go" on this page here: <https://www.speedtest.net/>

Connection speeds are measured in megabits per second or Mbps. For seamless streaming and hearing music lessons, we recommend that teachers use a mid-level plan, which is generally in the neighbourhood of 300 Mbps download speed. Many teachers do get away with basic plans offering 50 - 100 Mbps, but it becomes more difficult to diagnose which end of the connection, the student or teacher is responsible for poor connections. Most families pay for basic plans, which can suffice for online music lessons, but we find that in testing students may actually be operating at speeds much below this. Zoom recommends at least 2 Mbps as a minimum requirement, which in reality does not work well for seamless streaming of music.

Here are some considerations when assessing how to maximize connection speeds:

- Upgrade your speed with your internet provider. For teachers, it may only be an extra \$10 a month to go from 100 Mbps to 300 Mbps. The extra stability on your end may allow you to connect to more of your students more seamlessly and when connectivity symptoms arise, you are less likely to be the cause.
- Hardwire your laptop where possible. Connecting your computer directly to your router/modem with an ethernet cable (this is what we did before wifi) provides the most reliability. Using wifi can easily cut speeds by 30% over hard wired connections.
- Move the router/modem closer to your online studio. We have seen a router in the basement at the opposite end of the house from the main floor studio trim 300 Mbps to only 25 Mbps. Try simply moving your laptop next to the router and then test using wifi - note the difference. Then connect a short ethernet cable between your laptop and router and test again. This is usually a difficult option for families to act on - but feel free to suggest it anyway. Over time, they may find the resources to lower the distance somehow.
- Test different devices. Laptops are preferred, but in some cases, a smartphone or tablet may make more difference by connecting at higher speeds with a better microphone than an older laptop that can enable the extra audio settings. If there are two devices available, it could be best to use both. Anyone can connect multiple devices to the same

meeting - just be careful to only use one device for audio, otherwise you will set up an echo noise loop. Mute the mic and turn down volume on the speakers for one of the devices, or disconnect the device from audio all together.

- A very common issue for families is multiple devices connecting to the family's internet connection simultaneously during the lesson. This can quickly reduce connection speeds to a crawl and make a lesson impossible. Make the family aware that for lessons to continue, they should consider making the lesson the only priority for internet use during that time. This will be a very important consideration during an exam, and emphasizes the responsibility of the family for supporting the student's exam with a simple solution. If you are attempting to teach while others in your household are streaming and using the internet, it may be worth an upgrade to a 600 Mbps plan.

With each of these considerations, testing is key. Use the simple speed test available online, or use a testing app on mobile devices to determine which solutions are the easiest. There are no absolute rules on what the connection speed should be. It seems to be possible to conduct an effective seamless lesson on only 50 Mbps over wifi on a newer device where nobody is streaming at the same time, and the router is close by. Using a 300 Mbps connection seems to ensure strong connectivity in most environments, as long as not too many others are also using the same connection.

Improving Audio With An External Microphone

All microphones featured on both mobile devices and computers are very small which compress audio before being transmitted over the internet. Plugging in an external microphone to a laptop will enhance audio quality considerably. This is a good option for teachers, but won't do anything to improve the audio quality of your students, unless they also use an external mic. Your students will appreciate the quality of your audio during demonstrations and it will make you sound more professional, not to mention allow you to speak more naturally over the course of a long day of teaching. It is hard not to recommend the Blue Yeti USB microphone, which can be found in Canada online for only \$150. It plugs directly into your laptop through the USB port, will be recognized by Zoom, and delivers audio quality well beyond its price point.

<https://www.bestbuy.ca/en-ca/product/blue-microphones-blue-microphones-yeti-usb-microphon-e-blue-yeti/10154447>

It is recommended that students taking voice exams or other instruments with accompaniments (played on backing tracks or live) consider using an external mic to better capture the additional sound. Piano students taking exams at grade/level 8 or higher will also benefit from this solution. In general, using an external microphone with mobile devices can be difficult to set up. Older devices using older ios operating systems may not be compatible with some microphones.

Webcam Setup

For exams, we require that the webcam be positioned to capture a student's video to show a full side-view of the student with keyboard or frontal view with another instrument or for voice. This generally means positioning a laptop computer a bit back from the instrument on a separate table or stand. It is not required to see the student's hands up close at the keyboard and examiners will want to be able to communicate with students by seeing their face clearly. It will not be necessary to capture video of how they are using the pedals - this would potentially position the camera too far back.

Audio Delay

When sharing audio over the internet, we will always experience a slight delay, making it impossible to play in ensemble with students. This will not affect online exams, but there is a crude work around if teachers are looking to play along with their students.

- Have the student mute their microphone in Zoom while you play along with them. They will potentially follow you perfectly on their end, hearing your sound and emulating it. The deficit occurs on the teacher's end, as you will not hear their audio, and visually, they will appear slightly behind you in time.
- It is also possible to broadcast backing tracks to students in this fashion. Have them report back what their experience was. With the mic muted on their end, audio will only flow one way from your end to theirs. This should work well, as long as there is strong internet connectivity on both ends.

Internet Midi and eExams

Before social isolation, all of our eExams for piano used software from TimeWarp Technologies to connect two digital keyboards to share sounds. This enables the examiner to hear exactly what students are playing, through the speakers on their own keyboard as if the student were with them in the examiner's studio. These eExams are still continuing, but only from student's homes where they already have the software installed. This is the best option for all exam candidates, especially those playing exams from higher grade levels. However, there is a cost for the software and it takes a bit of work and expense to have it set up. CC is willing to work with any family and teacher to explore this option. Here is what is required:

- A digital keyboard with a USB out port. The port is often labelled "to computer" and would fit the square box end of a standard printer cable. Acoustic pianos cannot be used.
- A laptop computer, which connects to the keyboard using a printer cable. The flat end of the USB cable connects to the computer.
- Skype or Zoom must be installed to allow for a video connection.

- Internet Midi software from TimeWarp must be installed. They are offering 60% off the software until the end of May 2020, using the following coupon at checkout: CC2020. This puts the software at about \$40 CAD. This is typically the only expense.
- Coordinate further steps with the CC office to complete the connection and testing for use.
- Software is available for download here:
<https://timewarptech.com/shop/music-software-apps/software/internet-midi/?v=3e8d115eb4b3> You can also view video tutorials on this page.

To be clear, most students will not be using the software for June exams, but will be heard on their acoustic or digital pianos over Zoom. We are still scheduling our high tech eExams as usual, for those families that may have the software in their homes.

Extra Considerations For Teachers

- Zoom's free service has some limitations, namely a 40 minute maximum meeting time. Upgrading to Zoom Pro only costs \$14 per month and has features that allow you to personalize your meeting ID number, scheduling options, unlimited time on meetings, among other features.
- There are various online forums dedicated to teaching music online, specifically on Zoom. On FaceBook, we recommend "Conservatory Canada Teachers"; "Zoom Piano Teachers" and "Piano Teacher Canada." Zoom Piano Teachers features ideas from teachers who have held online recitals for students using Zoom.