



# Technical Considerations

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# Technical Considerations

## Hardware

### Camera

Some of the considerations when picking a camera is how it will be used in the particular workshop. Is there a need to demonstrate hands-on practical elements or is the workshop screen-based and screen-sharing is the only thing required? Facilitator needs to be seen.

Daniel's Ten Cents... The minimum resolution you'd want is 1080p and with that comes an understanding that not all web-cameras are created equal. Research is king here and understanding what you're getting is important before pressing buy. From personal research and experience outlined below are the three solutions I'd recommend/have used. These solutions cost, there's no denying that but in the long run you get what you pay for. Test what you have, look at what you're getting and make your own mind up. These are just the list of decisions I made with the information I had :).

1. **Logitech StreamCam** is going to cost you @ \$250 and you can get them from Officeworks as a click n collect or delivered item. They have exceptional picture quality, plug and play with all the platforms and comes with both a top of the screen and tripod mount option. It deals with low light okay and the built in microphones are actually really good and (better than my fancy Zoom H5n as the Logitech Streamcam has intelligent noise filtering built into it. Downside, they're USBC only and I wouldn't trust an adapter for USB3 as far as I can throw it. Which is a crap analogy as I can throw one a long way but that is not the point!!!! If you have a new HP or Mac, you're in for a treat but do know what your situation is before you press buy. I've got mine in the home office paired with one of the bigger Jobi Pods and have put them on proper tripods for capturing hand work but we'll get to mounting cameras under the mounting section.
2. **Logitech Brio** is the business if money is no object, these are the superstar cameras at \$380+. Short of the next option, this is the best quality imagery you're going to get into the computer. They're also USB3 and USB2 compatible (not as good a picture). Appreciate that both these options are Logitech but they really do have the market cornered at the minute with webcams. Everything that goes for the StreamCam goes for the Brio.
3. **A proper video camera** is always going to crap all over a web-camera. The sensors are bigger, the lenses better and the odds are you might have one lying around the office as a great many LGAs do. The question is how to get them into a computer and there are solutions for that so long as they have a HDMI out port on them. This can be solved with a Magewell HDMI USB Capture card (\$430+) or the recently back in stock Elgato CamLink Capture 4K (\$190). Both of these will turn the humble video camera into a web camera with the bonus of being able to record your end of the conversation to the camera. Useful if you're looking at repurposing facilitator footage for self paced learning options. The real difference is the size of the sensor. You're jumping from millimetres to centimetres and there is just more surface to capture information on. If you're going to go this far, you also will need a tripod but we'll get to that. With regards the Magewell and Elgato there isn't a huge difference between the two products and the price difference - as far as I can tell - is one is made for high end production environment and the other is used by every would be Twitch or new YouTube star with their camera rigs. They've both got a warranty so I'd suggest making your own mind up. If you're

around Brisbane and want to look at both, hit me up in an email.

To be honest, the video camera is my preferred option as it is the most versatile. If you have to buy a camera though it will cost you \$1000 plus. You need to look for a camera that allows for a clean feed over the HDMI; a feed without any of the LCD overlay information. JVC and Sony camera do this pretty much across their entire range. Many DSLRs and some compact cameras also. It really is a case of looking at what you've got access to, how much you're willing to spend and how it works with your situation. Web-cameras are always going to be less stuffing around and have one less piece of kit in the signal pathway but will never give the really pretty picture.

While we're talking about cameras we should mention lighting. When I used to make movies with kids for a living the professional mentors would always say the difference between the kids films and theirs was lighting. They were right. Dingy lighting equates to a dingy picture, no matter how good the camera. All the camera is capturing is reflected light from the surfaces that its sensor picks up. You need to consider helping that along and that can come down to considering where you're shooting (see below) or adding some additional lighting (see below). Regardless the option, this is a consideration you need to take into account and the best way to measure your success review the feed on a second computer dialled into your meeting/session. See what the audience is going to see and not what you're seeing in your playback window. It's not representative of reality otherwise and that is what matters.

## Microphone and Sound Considerations

Although many devices come with built-in microphones they will generally pick up everything in the room (and perhaps some traffic and dogs too).

**Daniel's Ten Cents...** People will forgive some crap video - they've been trained to accept it with Facebook and YouTube - but crap audio will turn them off pretty quickly and there is absolutely no reason for crap audio, other than being lazy or not being able to spend the money to fix it. The first thing is not an excuse and with the latter instance I'd argue you've got to spend some money on increasing the production value and if you have to choose one option from the myriad, this is where you start.

So mentioned in the video camera section, the two web-cams recommended have really good audio built into them with noise reduction. Odds are the video camera has probably got decent audio. Testing to see how it goes with your setup - as mentioned above, checking from the client perspective rather than your monitor - to see how it sounds and make a call. If you're in a quiet room with not a lot of reflective surfaces you're probably going to be okay.

**DO NOT USE THE CHEAP AND NASTY MICROPHONE THAT CAME WITH YOUR MOBILE PHONE!!!!!!** If you've spent a crap load on something like the AirPods, Google equivalent, Bose or Sennheisers you might be in luck or maybe not. I've got good ones and they're just not good enough from where I am sitting and listening. The microphone on my Macbook is okay but not great; it's designed for meetings, not performance or production. I am yet to find a PC that has a great built in microphone but that might be I am a snob. So all the negatives said, what are the options?

1. External sound card like a Zoom H1 or better. They range from \$120 to \$600 and will get you excellent sound. So will a Tascam and other brands; I use the term Zoom the same way

BandAid is a brandname and the standing nomenclature. For most people this is an overkill solution but it is something that a lot of organisations might already own. The inbuilt preamps, gain control etc will improve sound quality and they give some fine tuning to the input. They also provide balanced and powered inputs for other microphones, which has the larger benefit of maybe providing opportunity for future podcasting aspirations. This is one of those nerd toys I replace on a five year cycle and never regret having access too/never stop finding reasons to use it. I have mine at home mounted over my desk on a Manfrotto Magic Arm. I have a number of things mounted on Magic Arms and I might have a problem. More on Manfrotto Magic Arms later.

2. An external micro will do wonders eliminating the general background crud if you choose the right option. We've moved to using lavalier microphones (mostly known as lapel microphones) as they get the sound closest to the microphone, they're discrete and it's what they're designed for. There are a couple of options though to consider when going down this route, which mostly are will you be moving around a lot and thus yanking the cable out of the computer over and over again? If you are, let us recommend upfront that you should consider getting a wireless solution. We've presently deployed the [Rode Wireless GO](#). One end plugs into the laptop and the other end clips to the presenter, which is a small black or white square. It will also take a more traditional microphone as well. This device is professional grade but designed to be user friendly. So long as it is charged and plugged into the right places it will work a treat. As a side note, you'll see Rode mentioned as a brand a couple of times in my notes. That's because they're a good quality brand, Australian made, available from most every local supplier and they have a rock solid warranty program that is based in Australia. You do you and do your own research; this is the way we went.
3. **NB.** One thing to bear in mind when you're buying this equipment it really does matter where it comes from. You will find with cameras and audio equipment - not all but a lot of it - that the warranty is local to the country you buy it from. If it imports from USA or UK or China there's a solid probability that the warranty won't be honoured. Which is not great when spending several hundreds of dollars from budget lines that don't have a lot of replacement fat in them. A phrase you want to avoid at all costs when buying this kind of kit is grey imports; when items are purchased from a cheaper market, imported and sold locally. This tends to be more prevalent with smaller online retailers and Ebay purchases. Have had it happen with Amazon but that's been rare. It might look a lot cheaper in the upfront but you will not get it covered under warranty, even if the item is DOA and having spent the better part of 20 years in this space I have lost track of how many DOA devices and items I have had delivered from reputable brands. It's the reality of high volume consumer electronics; problems slip through the crack. Always check and be sure. If in doubt, deal with brick and mortar retailers in Australia (or the country you're reading this in) either in person or online. because at least then you'll have a phone number to call or shopfront to walk into and declare 'I... would like to make... a complaint' Monty Python's Dead Parrot sketch style.
4. You don't have to go a lavalier microphone. You could go a boom microphone, Podcaster or similar. If you've got a good quality camera and the room is quiet then you can go with that. When making the decision you really have to consider the background noise you're competing with. The best option if you can if record/stream in a quiet room that doesn't have an echo. The next option if the room is noisy if find a space that is quiet and doesn't have an echo (Andrei would have a better way to articulate this but he's an audio professional and I am a workshop delivering hack). There is no third option. You need to control the space you're recording in and take responsibility for it. Crap in and crap out is the sad reality. If the punters can't hear you or it is difficult to make out what you're saying then that is that; they will tune out.

5. You're going to need headphones or earbuds. It's that simple and it's not really an option. Alternatively you need fold-back speakers to hear what they're saying and then you need to make sure you're not getting any feedback on the microphone/speakers. Which means you need to test these things and you need to test them well in advance of people coming into the Zoom room for the session. If you're going to go with headphones then go with wireless ones for the same reason that we went with a wireless microphone setup; less cable means less tangling and less ripping stuff off of the table when you forget that you're plugged in. You do not want to break your expensive streaming setup because you're a klutz. Take it from someone that has been there, broken that and had to outlay replacement dollars because no insurance I've found insures against my own idiocy. When we say speakers, they don't have to be expensive but it never hurts that they don't sound like rubbish. When I say headphones, if you're doing this for a living then investing in a decent set of earbuds or headphones is a necessity. Mine are all bluetooth, they make lovely sound in my ear, I can wear them for hours on end without irritation and they have at least six hours battery life which is fully charged anytime I am delivering a public program to ensure I'm not going to run out half way through. As always though; you do you. This is what works for me and for us but you might be an entirely different kettle of fish.

## Streaming Device

- Desktop
- Laptop
- Smart device

## Internet Connection

### Bandwidth requirements:

#### Standard HD (720p)

- Group video calls: 1.5 Mbps (up/down)

#### Full HD (1080p) Group video calls:

- Receiving 1080p HD video requires a minimum of 2.5 Mbps
- Sending 1080p video requires a minimum of 3.0 Mbps

## Monitors

It is a big bonus to have access to a second monitor if screen-sharing is part of the workshop. This allows the facilitator to have an overview of participants and reading body language and mood and whether participants are raising their hands to ask a question. In some instances participants will show you their work (if physical) using their cameras. Seeing the participants during the workshop will help connect with them and makes the experience feel less one sided.

## Other

- Lighting

# Room Acoustics, Background Noise and Mic Technique

No matter how good your recording gear is, the acoustic environment is still the main factor in audio recording quality.

## Understanding your space's acoustics

The easiest way to think about acoustics is in terms of acoustic 'comfort'. Ask yourself the question - how easy it is to hold a conversation with a few people in this space? Do I need to raise my voice to be heard with a few people in the room? Am I missing details in conversations? Does the space feel echo-y or 'cold'? Is there sound leaking in from outside, or being made by equipment in the room? If you answer yes to any of these questions, then the easy fix is change your acoustic environment - by finding another space to use.

## What to look (and listen for) in a space

In technical terms, a good acoustic space for recording speech has a flat frequency response, a RT60 of less than one second, with a diffuse near field response. In non-technical terms, we are looking (listening) for a room that is:

- warm sounding,
- small enough to feel personal
- not boomy or echoing (not an empty garage or bathroom 😊)

You will find that rooms in your workspace or house that meet this criteria will have carpet or a rug, soft furnishings, a book shelf or two and a well sealed door.

## Background Noise, Buzz and Hum

Background noise can be acoustic, meaning its present in the physical space your are recording in, or it can be produced electronically by microphones, faulty cables or even the USB ports on a computer<sup>1</sup>. A noise can be sustained, like an air-conditioner, or an intermittent interruption like a dog barking. As mentioned above, the best way to deal with noise is to remove it - either by changing your location, workshop time, or removing the source of the noise. but if this isn't possible you can make your audio source louder (speak up!) and experiment with microphone technique, gain and digital audio processing.



## Mic Technique

Your mic will have an optimal position and orientation - you want to place it as close as is feasible to your audio source (you!) and make sure you are addressing the mic capsule<sup>2)</sup> directly. If you are using a built in microphone on a laptop or webcam you are of course a bit restricted by the best place for video, so a separate microphone give a few more options.

**IMPORTANT** Mics are either end addressed - like the Shure SM58 pictured below - which means you speak into the end of the mic.

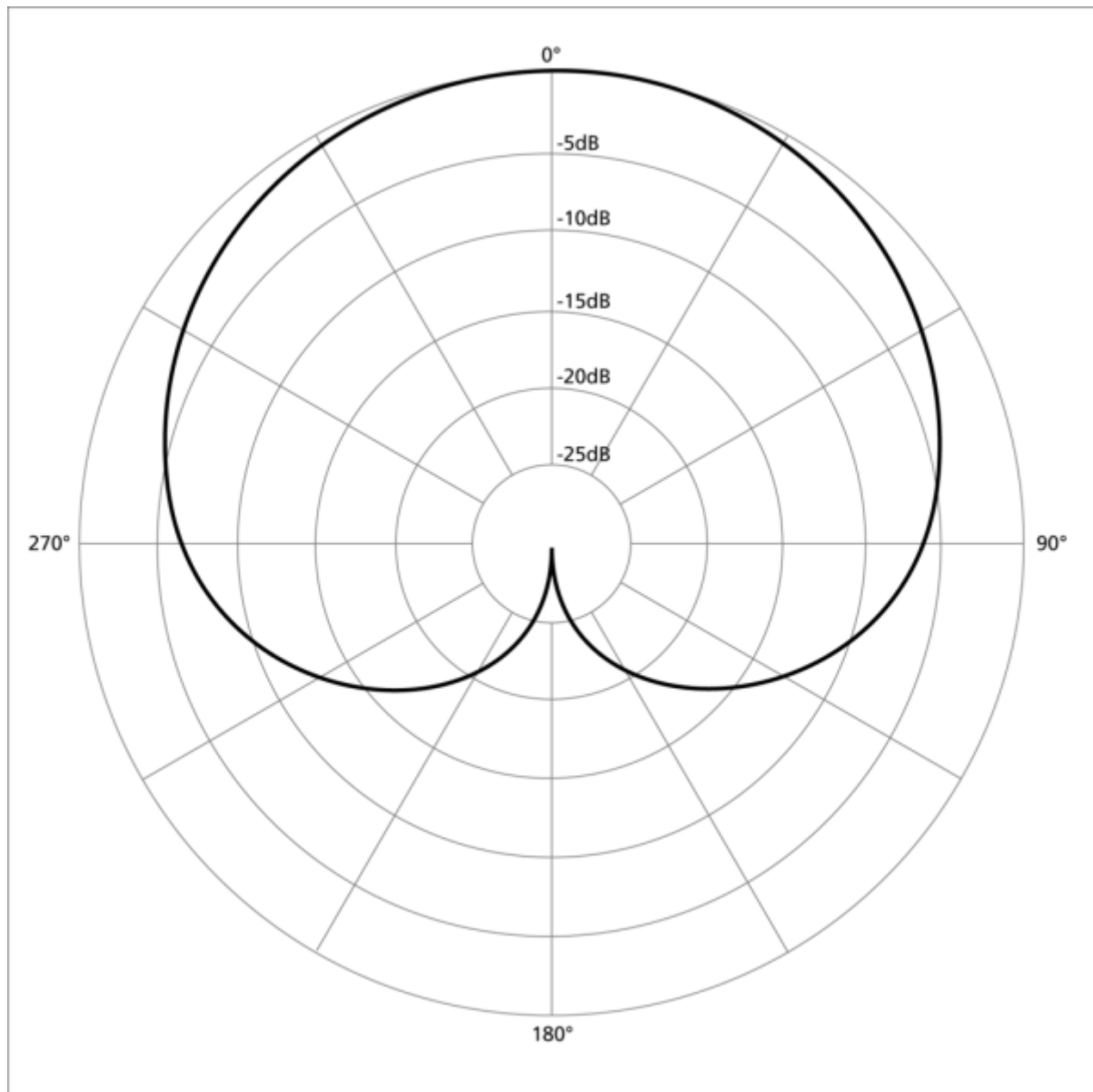


or side addressed - like the Numann TLM107 - where you speak into the front of the mic, usually facing the badge or logo.



All mic will have a *polar pattern* that describes its sensitivity - most vocal mics have a cardioid pattern and they are most sensitive when addressed from the front of the capsule.





Take a look at the mic technique of an experienced podcaster like Joe Rogan - you will notice that his mouth (the audio source) stays in pretty much the same position, on the same microphone (a Shure SM7b) right in the sweet spot of the mic polar pattern. This is key to a consistent, quality vocal recording and the main factor in creating a “signature sound”.

## Microphone Gain

Gain is an electronic process use to amplify (make louder) or attenuate (make softer) a microphones output signal level with a mic pre-amplifier (pre-amp). With built-in microphones your gain options are controlled by the sound control panel or drivers that displays the microphone signal level in real-time - called metering. As a general rule in this case your device will probably have an “auto-gain” feature that adjusts the gain automatically. By default you should be using auto-gain, the less we have to think about the better, but if you find your level is flucuating wildly due to some other sounds intruding test what a fixed gain level sounds like. Adjust your gain slider until your voice signal is in the top three quarters of the meters, without the meters turning red.

## Distortion

Distortion is that ugly crackling sound that results from the mic pre-amp signal being over amplified. There are many different kinds of distortion, but for our purposes, any distortion is bad and usually results from too much pre-amp gain. You should always test your mic levels before your workshop - you want to avoid any red on your metering.

## Feedback

Feedback is the horrible ringing/whistling sound that we've all probably heard at some point. This occurs when the output of a microphone is amplified, and played back ***in the same acoustic space*** as the microphone by speakers.

The microphone amplifies its own signal again and again creating a feedback loop, until one or more frequencies overwhelms all the others and stabs you in the ear.

Feedback can be painful and even damaging to your hearing, so it's important to avoid and know how to stop it dead, fortunately this is simple to do.

The two options for controlling feedback are:

- mute the acoustic output of speakers - turn them completely down or off.
- mute the mic signal output - turn down the gain or turn the mic off.

Once the feedback is under control, you will need to work out where the loop is occurring and eliminate it. If you have more than one participant in a room - it's quite possible for *your* microphone to create a feedback loop with *their* speakers. So the general rule is:

One microphone and one speaker per acoustic environment  
(room)

## Digital Noise Reduction

### Software

- [OBS](#) for advanced mixing of feeds into Zoom.
- [CamTwist](#) Free simplified version of OBS for Mac
- [OBS Mac Virtualcam](#) will output OBS as a virtual camera for Zoom/Teams.
- [Krisp AI Noise Cancellation](#) Uses AI to remove background noise in realtime. James has been using this for sometime and it works pretty well when not in a clean environment
- [Webcam Settings Control \(Mac\)](#) gives you more advanced webcam options, allowing you to change the frequency of the video between 60Hz to 50Hz. This removes the flicker when under some LED/Fluorescent lights
- [Loopback \(Mac\)](#) Simple virtual audio mixer for multiple inputs (microphones/application audio)

- OBS Camera (various app stores) - Allows you to use phones/tablet cameras as webcams in OBS over a network. You do require a fast network (no wifi). Best to use ethernet dongles for iOS devices
- <https://www.nvidia.com/en-us/geforce/guides/nvidia-rtx-voice-setup-guide/> - Enables real-time noise reduction with Nvidia video cards.

## Cloud Platforms

<sup>1)</sup>

this is likely linked to low quality or faulty power supplies

<sup>2)</sup>

the electronic component that transforms acoustic energy into electrical energy