Penguin Prof EDU How-To:
Sound and Acoustics

I get a lot of questions about sound and audio recording - and for good reason; nothing ruins a video faster than poor audio. If the audio is bad, the viewer will click out of the video almost immediately. Like good design, excellent audio is simply not noticed - it's almost invisible.

When considering your videos, it's extremely important to consider the room you will be in and the equipment you will use. I've spent the last couple of years working on audio improvement and I've learned quite a lot. Realize that my choices are personal and that I am not an audio engineer. This post is about sound and the physics you should understand when designing a good sound recording area.

All About Sound

Considering that most professional studios spend thousands of dollars getting the desired acoustic properties, you will probably want to set a financial limit on how far you want to go. Here's what you need to know:

Sound refers to the vibrations that travel through the air or another medium and can be heard when they reach a person's or animal's ear. Sound is measured in vibrations per second, which is called Hertz (Hz). Sound is often divided into three main categories:

Low 25Hz to 250Hz	Tones you can feel as well as hear
Mid 250Hz to 2500Hz	Tones in the range of the human voice
High 2500Hz to 25000Hz	Tones you can easily block out by covering your ears

Each of these ranges have their own challenges and can be altered with specific objects as described later. Common problems by having too much or too little of a frequency range include:

Low: Bass tones which are boomy or disappear.

Mid: Unclear sound; it can be hard to distinguish instruments, or sometimes the voice or music is sharp or painful.

High A high pitched ring in the room, or a room sounding muffled.

Are you a science nerd like me? Cool. Here are two cool equations of interest:

$$\zeta = \frac{c}{2\sqrt{mk}}.$$

$$\omega_0 = \sqrt{\frac{k}{m}}$$

The first parameter, ω0, is called the (undamped) natural frequency of the system. The second parameter, ζ, is called the damping ratio. The natural frequency represents an angular frequency, expressed in radians per second. The damping ratio is a dimensionless quantity." From: https://en.wikipedia.org/wiki/Damping

What this means is that *every substance will dampen sound* - how much it will dampen the sound depends on two factors:

1. each material will have a certain property that determines how well it can dampen frequencies
2. increasing the mass will lower the dampened frequency. This is actually quite intuitive; while a Kleenex tissue might absorb some high frequencies, you need something like a mattress to dampen lower frequencies.

For many more details on all of this, check out these resources:

- http://www.soundonsound.com/sos/dec07/articles/acoustics.htm
- http://www.soundonsound.com/sos/feb06/articles/studiosos.htm
- http://www.homestudiocorner.com/home-studio-necessities-8-acoustic-treatment/
- http://www.gearslutz.com/board/low-end-theory/434479-studio-acoustic-treatment-low-budget.html
- http://mediamusicforum.com/home-studio-acoustics.html
- https://www.google.nl/search?q=low+cost+studio+treatment&oq=low+cost+studio+treatment&aqs=chrome.0.57j60j59j60j61j60.3744j0&sourceid=chrome&ie=UTF-8

The more you understand about sound and acoustics, the better equipped you will be to select recording equipment and design your recording space - the topic of my next EDU How-To.