Analyzing the Effect of Micro-Perforated Acoustical Tape vs. Acoustical Tiles on the Sound Intensity in an Art Room Using Spectral Analysis and Two- and Three-Dimensional Acoustical Modeling Software

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This study used 3D modeling and spectral analysis to understand the effects of different sound dampening materials/devices (acoustical tape and tiles) in an acoustically challenged middle school art room and to document, study, and reduce the effects of white noise produced by the room's HVAC system. In the art room, sound intensity was measured when different sound dampening methods were in place: dampening tiles, tape, and both installed. The 3D model was found to be capable of modelling the room accurately; However, at the higher frequencies, the tile was less effective at reducing the decibel levels in the art room. Overall, it was determined the tape reduced the sound intensity more than the tiles. But the tape and tile installed at the same time, reduced the decibels more than either dampening treatment. In order to see the causes of white noise, a spectral analysis was performed in MATLAB. Initially, resonance occurred at lower frequencies (65, 125, and 250Hz). However, after researching the specifications of the speaker used, it was determined a higher quality speaker was needed. When the spectral analysis was redone with a higher quality speaker, resonance diminished in lower frequencies. However, resonance occurred in all frequencies around 119Hz. This is thought to be the frequency of the lights/HVAC. In the future, to confirm this theory, audio could be recorded with the lights/HVAC off and a spectral analysis done. If the lights were the cause of this resonance, the resonance would then diminish from the spectrogram.

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