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## Acoustics Alert

By Michael Fickes | May 1st, 2015

In the Monty Python movie “Life of Brian,” a scene shows a crowd listening as Jesus delivers the Sermon on the Mount. The camera moves back over the crowd to the back where no one can hear anything of the Beatitudes. They call out to the people just in front of them asking what is being said. They can barely hear, and they are not getting it quite right. Suddenly someone turns around and reports that Jesus just said: “Blessed are the cheesemakers.”

“So this magnificent lesson, one of the great lessons of history was lost to the people in the back rows because they couldn’t hear it,” says David Lubman, an acoustics consultant based in Westminster, Calif., who enjoys telling that story when discussing the importance of good acoustics to learning in schools.



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Numerous studies have shown that excessive background noise and reverberation make it difficult to hear. In schools, the problem can prevent teachers from communicating and also prevent students with normal hearing from learning. It can lead to disastrous problems for students with impaired hearing.

Research also indicates that poor acoustics can lead teachers to raise their voices, which can strain vocal cords and create medical issues.

Background noise comes from the mechanical systems or from traffic and outdoor noise in schools where the windows must open to provide ventilation. It can also come from footsteps and scraping chairs on the floor above.

Reverberation is the length of time a sound lasts in a room. That may sound strange, but sounds reverberate or bounce off of surfaces in a room a number of times before subsiding. The length of these sounds can be measured.

Many have dismissed the idea of designing classrooms to recommended acoustical standards as a non-problem. But it is a problem.

In 2010, the Technical Committee on Architectural Acoustics of the Acoustical Society of America issued a paper entitled “Classroom Acoustics” that states: “In many classrooms in the United States, the speech

intelligibility rating is 75 percent or less. That means that, in speech intelligibility tests, listeners with normal hearing can understand only 75 percent of the words read from a list. Imagine reading a textbook with every fourth word missing and being expected to understand the material and be tested on it. Sounds ridiculous? Well, that is exactly the situation facing students every day in schools all across the country.”

Background noise and reverberation are the cause.

## Background noise

Lubman says that school ventilation systems typically generate 50 decibels of background noise and present a distinct challenge to students trying to understand what teachers are saying. That’s especially true of students sitting in the back of the room as well as those who are hearing impaired.

“For many years, educators didn’t understand the problem,” continues Lubman. “In the late 1990s, an acoustical consultant told me and others that background noise in classrooms had to be limited to 35 decibels for students to hear properly.

“I was not persuaded. Later, however, I came across a book called ‘Acoustical Designing in Architecture’ by Vern Knudsen and Cyril Harris, two educators, architectural acousticians and past president of the Acoustical Society of America.

“The book said that the desired level of background noise in a classroom should not exceed 35 decibels. Thirty-five decibels is the background noise level in a quiet bedroom.”

For the sake of contrast, a whisper is about 15 decibels and normal conversation is around 60 decibels.

Unaccountably, “Acoustical Designing in Architecture” was written 1929. In other words, this information about classroom acoustical levels has been available for debate, testing and scrutiny for 86 years.

It’s also important to remember that not all students are equal in hearing ability, says Lubman. Some have hearing impairments, which means that the 35-decibel limit on background noise isn’t good enough for them. When these children perform poorly, they are placed in special education classes, probably ensuring that they cannot live up to their potential.



PHOTO COURTESY OF SHW GROUP

**Hear Me Now?** Factors like background noise, reverberation and the quieter speech of some teachers makes good acoustical design a critical component of everyday learning in the classroom and especially alternative learning spaces.

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