

What is a Classroom Soundfield System?

A “Classroom Soundfield System” is essentially a small public address sound system, designed for the confines of a typical classroom of 25-35 students.

From a hardware standpoint, the system usually consists of 2 wireless microphones. One is primarily for the teacher, and the 2nd mic is generally used by students. Most soundfield systems are currently using infrared wireless mic technology. Since infrared is based on pulsating light, the transmission of the wireless mics will not penetrate the walls of a classroom into another room. This allows us to set up dozens or even hundreds of classrooms very close to each other with no interference.

The system also features a built in mixer and amplifier that will also be able to amplify audio from such sources as a computer, a DVD, tv tuner, or even an Ipod.

The next critical part of a Soundfield System consists of several (4 or more) overhead ceiling speakers. The key to really making a Soundfield system work effectively is a smooth “wash” of sound throughout the entire classroom. Ideally, every student should be listening at a distance of about 6 feet from the nearest loudspeaker so that we maintain the illusion of having the teacher standing 6 feet in front of you.

Ceiling loudspeakers are kind of like ceiling light bulbs. For even coverage, you wouldn't use just 1 or 2 to cover the entire classroom. The same goes for ceiling loudspeakers.

The main problem that students encounter while trying to listen to instruction is that they are simply too far from the teacher's voice and the classroom can be a noisy environment with computers and air conditioning.

In a world of Ipods, loud car stereos, very loud movie theatres, noisy video games and home television, most students simply do not pay attention to low sound levels (or teacher's instructions) that are less than 63-65 decibels.

If a teacher tries to produce 75 decibels of sound at arm's length (about 18”) they will find that this is no easy feat. Plus, that 75 decibel sound wave is going to be reduced to 63 decibels at 6 feet from the teacher's voice. (that old inverse square law rule from physics class). The front row in most schools is about 6 feet from the teacher.

Back to that 63 decibel level at the first rowOnce you move back a couple of rows to 12 feet from the teacher, the teacher's voice drops (especially in the area of consonants) another 6 decibels to about 57 decibels. The very last row tends to be about 20-24 feet from the teacher's voice and although inverse square law tends to stop being a factor after about 15 ft, that distance produces another 2-3 decibels in loss of sound. That final sound level from the teacher at 54-55 decibels in the back rows is simply not enough to get good student attention. Thus, the need for amplification.

Plus, if the teacher turns his/her back to the students while at the chalkboard/interactive board, the teacher's voice is “splattered” and reflected off the front wall or screen and is much more difficult for any students to understand.

In summary, wearing a wireless microphone allows the teacher's voice to always appear as if he/she is facing the student and the amplified overhead ceiling speakers give the illusion of the teacher only being 6 feet away. ***The magic of modern technology.***

Student Benefits from Classroom Soundfield Systems

Out of a total of more than 3 million classrooms in the US, there are currently over 220,000 “amplified classrooms” in the country today. This number is growing by about 20% annually.

Students spend at least 45% of the school day engaged in listening activities.

Information in speech is contained in consonant sounds. The human voice is not designed to project consonant sounds, and because of their frequency range, they are difficult to transmit over the ambient sound level.

Consonants are carried by the weak high frequencies, while vowels are carried by the stronger low frequencies. 90% of the energy of speech is carried by the low frequencies, yet only 10% of the intelligibility resides in the low frequencies. Therefore, the louder the teacher talks, the less intelligible the sound becomes, because loud voices power the vowels, but obscure the consonants (the softest component of language). It is most important to reinforce the soft consonants that are the beginnings and endings of words and infer meaning. When someone speaks loudly, vowel energy is increased, but consonant energy is not increased to the same degree. Loud voices as opposed to a soft nurturing voice are less conducive to learning.

The inability to hear clearly also leads to inattentiveness and behavioral problems. Often, these “attitudinal” problems are a reflection of the student’s frustration with not being able to hear, rather than their desire to be disruptive.

The MAARS Study was the first investigation of using amplified classrooms in 1984. The study was funded in part by the US Dept of Education, and showed that students in the amplified classrooms achieved significantly (+10 to 15%) improved reading scores. There have now been more than 50 additional studies in this area of amplified classrooms.

Orange County Public School District (OCPS) in Orlando, Florida conducted a multi year study in which the results showed that students in sound enhanced classrooms scored 10% higher on average on the Florida Comprehensive Achievement Test (FCAT) than students in classrooms without sound enhancement.

During 2002, in a study (DiSarno, Schowalter and Grassa) of 9-12th grade classrooms with learning disabled students, sound amplification systems were installed and after only 12 weeks, showed “a significant improvement of students listening and academic behaviors after 12 weeks, as measured by two evaluators. The main benefit of sound-field amplification cited in this study was an increase in the teacher’s ability to get and maintain student’s attention”

The Trost Study, an independent study of amplified classrooms in Canby, Oregon found that these rooms achieved;

- *35 % higher first grade scores on the Dynamic Indicators of Basic Early Skills (DIBELS)
- *35% higher words-per-minute reading scores by fourth and fifth graders
- *21% higher scores on the Technology Enhanced Student Assessment, a standardized test given by the Oregon Department of Education
- *72% decrease in teacher redirections
- *43% decrease in off-task student behaviors

Patrick Mahaffey, a third graded teacher at Carlsbad, California's Olivehain Pioneer Elementary schools states that "children with attention deficit disorder tend to have a little longer period of focus time".

In many school districts, special education referrals (which can be quite costly to the school district) have dropped to nearly half compared to what they were before systems were introduced.

Average cost of a Classroom Soundfield System is \$800-\$1700. (Equivalent to 1 computer). Based on 5 years usage in a 30 pupil classroom, the average cost would be 3-5 cents per day per pupil.

The state of Ohio recently mandated that all new schools being built must include a classroom wireless microphone amplification (soundfield) system.

Teacher benefits from Classroom Soundfield Systems

A US study found that teachers take an average of 2 days sick leave per year. (According to National center for Educational Statistics)

Fact: Teachers make up only 4% of the working population, but account for at least 20% of all voice clinic patients (Titze et al 1997)

Teachers use their voices an average of 6.3 hours per day

The voice problems of teachers cost the US 2.5 billion \$ annually (Verdonlini, and Ramig 2001)

47% of teachers experience of have experienced problems with their voice.

Voice fatigue and throat infections account for 11% to 16% of teacher absenteeism

Voice problems among teachers are often a major cause of physical “burn out”, vocal fatigue, and other related illnesses that have a profound effect of teacher retention. When sound enhancement systems are installed in classrooms, teacher absenteeism declines.

A recent study found that teachers are 32 times more likely to be plagued with voice problems compared with other voice dependent professionals. These problems also restrict the student’s ability to learn and impair the teacher’s quality of life and attitude towards teaching. They may progress to the point where skilled teachers leave the profession.

Studies have shown that the use of sound enhanced classrooms can result in substantial annual savings for the school district in substitute teacher pay.

The Dubuque Community Schools in Iowa employ approximately 650 full time teachers
In 1996, the Dubuque Community School District reported teachers in classrooms without sound enhancement averaged 52 sick days per year due to voice or throat problems. (0.93 sick days per year per teacher). However, teachers in sound enhanced classrooms took only 19 days per year (0.34 days per year) for the same problems. Substitute teacher pay is currently approximately \$120 per day. Every 12-14 days saved by the district would cover the cost of a sound enhancement system.

A study released in March 2007, “Improving the Classroom Environment: Classroom Amplification Systems” by the Miami-Dade County Public Schools found that teacher absenteeism was also 25% less in the sound enhanced classrooms.

The MAARS study found that teacher absenteeism due to vocal strain were reduced from 15% to 2-3% in one year.

Actual quotes by educators using sound enhanced classrooms;

“Of all the money we spent on this building, classroom sound was probably the best money we spent. Some teachers who were very reluctant now love it. I’ve created a monster.”

Thomas Ellis, principal Sparks Elementary School, Maryland

“Across the board, teachers rank the classroom sound system as the technology they find most helpful. They still have their voices at the end of the day.”

Katherine Clark, Principal Ocoee Middle School, Orlando Florida

“I would be lost without it! I am certainly less tired at the end of a 6 lesson day. Having the sound system has definitely extended my Shelf Life as a teacher. I was intending to retire at the end of this academic year. Having the system is a large part of the reason why I shall do another year.”

Mrs. A. Wallin, English teacher Bohunt School New Hampshire

“If they had to cut back the budget right now, I would tell them they can take back the document camera and the video projector. They are nice, but I can teach without them. However, they are not taking away my new sound system. This is the first time in 25 years of teaching, that I have not blown out my voice in the first 6 weeks of school.”

Barbara Brown, 4th grade teacher Duarte School District - California

“At first, none of us really wanted to wear these things, but once you get used to it, it’s hard to go back to raising your voice.”

Sheila Guttman 3rd grade teacher , Sparks, Maryland

“The sound system makes my presence known more so discipline is easier. I don’t have to struggle to get my student’s attention.”

grade art teacher Orem Utah

Berni Mortensen 5th

“It keeps up a consistent volume. Some kids have even asked teachers who were not using it to turn it on.”

Karen Cordell, principal Dogwood Elementary, Baltimore Maryland



1688 Ord Way Oceanside, CA 92056
Phone: 800 588-0018
FAX: 760 631-7800
www.teachlogic.com