By Mark Smith

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Can You Hear Me Now?

Come in loud and clear with a wireless classroom audio system.

Su madre esta en la casa. Sounds like a simple sentence in Spanish—your mother is in the house. But what if your students are sitting next to a loud air conditioner or a noisy hallway or your voice is shot after a week of teaching classes? Those words could be misheard—*padre* for *madre*, *pasa* for *casa*—and suddenly all meaning gets lost.

As school performance under NCLB becomes increasingly important, districts can't afford to have barriers to learning. That's where wireless sound-field amplification systems come into play.

Wireless sound-field amplification systems come in two types: radio frequency (RF) and infrared (IR). RF systems are based on FCC-approved FM and UHF bands (commonly used for radio and television, respectively), and IR systems use infrared light to send signals between a microphone and receiver. The systems consist of a handheld or headset mic, a receiver, and a set of speakers (external, in-ceiling, or in-wall models).

When it comes to sound reinforcement in the classroom, districts have a host of options to choose from. In this article, I'll look at wireless, permanently installed systems focused on amplifying speech, not music.

Sound Practice

According to a 1978 study, an educator's voice tends to be only 5 decibels (dB) louder than the room noise itself, yet an English-speaking student with normal hearing needs the teacher's vocal level to be 12 dB higher than the room noise for 100 percent accuracy. And a government study (The Marrs Study) suggested that as much as a quarter of the student population suffers from "minimal" hearing loss, thus increasing the chance for missed information. Finally, most people's hearing does not fully develop until age 15.

With those factors in mind, what can you do to help students hear properly? Asking instructors to speak more forcefully is one option, but it's not very practical. A simple solution is to provide an easy-to-use sound reinforcement system that gives educators the ability to project their voices with a minimum amount of strain.

That reduction in vocal stress means fewer teacher absences (as a U.S. Department of Education study found); other studies suggest that all students—including those with attention-deficit disorder and behavioral problems—can benefit from these systems.

Of course, administrators must balance the positive effects of sound reinforcement on educators and students with the ever-present issue of funding imperatives. Those worried about return on investment can turn to a 1995 study by the Florida Department of Education, which found that the per-student cost of wireless sound reinforcement systems comes to fractions of a penny per day.

Phonic Ear's Front Row pro 903TM lavalier mic is a hands-free solution for voice amplification.

Balance those findings (even adjusted for inflation a decade later) with U.S. Department of Education studies that link sound reinforcement systems in classrooms to improved test scores on reading and language and reduced referrals to special education programs (not to mention reductions in discipline problems), and you have many powerful reasons to spend those precious funds on sound reinforcement. Simply put, better test scores and less strain on your district's special needs programs can make sound-reinforcement systems a steal.

The Right Sound

When considering which type of wireless system to use, districts must juggle a host of concerns, ranging from cost (including where the funds will come from) to performance.

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Both FM and IR systems are solid choices, and chances are either one will work just fine for your classrooms. However, each system does have possible drawbacks. First, FM sound reinforcement can face interference issues, usually when there are many individual units in close proximity. That interference can take the form of overlapping signals—much like when you're on the edge of two competing radio stations and you're able to pick both up simultaneously. Obviously, it would be difficult to adequately discuss T.S. Eliot's "The Wasteland" while getting interference from the algebra teacher next door.

For IR systems, line of sight can be an issue—irregularly shaped classrooms can impede signal transmission, which results in audio dropping out in certain areas. The bigger or more oddly shaped the room, the greater the need for additional IR transmitters to prevent dead areas. Fluorescent lighting can sometimes interfere with IR transmission, as well.

A consultant will take into account these issues and help prevent problems before they arise. Ultimately, price will be your most pressing concern. (To find more information about consultants, contact the National Systems Contractors Association at www.nsca.org.)

So Many Mics, So Many Choices

Although many systems come with handheld microphones, districts should look into headsets for their educators. A hands-free headset allows an educator to write on a whiteboard, type on a computer, or assist a student without having to juggle a microphone. Also, many users have some difficulty with mic technique—they'll speak into a microphone at an off-axis angle, which interferes with the mic's ability to pick up sound, or they will place it too close to their lips, thus inducing the proximity effect (which exaggerates the bass frequencies and distorts intelligibility).

A headset mic, once adjusted correctly, allows the educator freedom to roam about the classroom without having to worry about these factors. One twist on the headset is the lavalier mic, which hangs from the neck or is affixed to a lapel. Ask your consultant to supply multiple microphone options so your educators can test drive different models—this will give you a better idea of what will work best in your district.

Another issue to consider is speaker type. Do you want speakers that have a low visual profile and that would be difficult to steal or damage? Also consider: Is your district cash-strapped (whose isn't)? Is the system for a school under construction/renovation, or is it a legacy school built by the W.P.A. in the 1930s?

With those factors in mind, districts can choose between three types: in-ceiling, in-wall, and surface mount speakers. Most people are familiar with in-ceiling speakers—next time you're in the dentist's chair listening to Muzak, simply take a

The Sennheiser EW135G2 is a simple and robust RF system.

The Seattle Sound

One urban school district takes the sound-reinforcement plunge.

For Seattle Public Schools, introducing sound reinforcement into classrooms has been a gradual and careful process. Manuel Ovena, director of the Department of Technology Services, says the district installed the sound systems in some of its remodeled classrooms first and is now examining bids for the older classrooms (Phonic Ear, LightSpeed Technologies, and Audio Enhancement are currently on the district's radar).

"In talking with teachers, audiologists, and students and reviewing education literature, we found that sound systems were probably one of the few technology enhancements that have empirical proof of improving student achievement," Ovena says. "The kids comment that they have more confidence in speaking up (due to the mic that is passed around) and can hear the teacher well. A common response is that 'the teacher doesn't yell at us anymore.'"

Educators in the district can choose between handheld, headset, or lavalier microphones, and students are able to pass a handheld mic when they need to speak up in class.

The classrooms in the district will use RF or IR systems depending on the best reception in each room, Ovena says, and portable RF systems will be available for libraries. The district opted for surface mount speakers.

"We definitely feel that this is a good investment, and teachers are very anxious to have them installed in their elementary classrooms," Ovena says. —*MS*

and forth like the voice of a hiker shouting in a canyon.

That said, you'll want a short decay time of about no more than 2.5 seconds and no less than 1 second for optimal speech. An audio consultant will be able to discern each classroom's sound characteristics and suggest solutions to mitigate any problems. That could mean adding acoustical room treatments like baffles (lightweight fixtures attached to walls or hung from ceilings for sound absorption), carpeting, and even drapes to the overall cost of the system. &

Mark Smith *is managing editor of* Technology & Learning.

Toolbox

Scores of manufacturers produce wireless sound systems for classrooms. Here's a sampling.

Audio Enhancement
http://audioenhancement.com

Audio-Technica
www.audio-technica.com

Centrum Sound
www.centrumsound.com

Custom AllHear
www.customallhear.com

Hamilton Electronics
www.hamiltonelectronics.com

Lifeline Amplication Systems
www.lifelineamp.com

Lightspeed Technologies
www.lightspeed-tek.com

OWI
www.owi-inc.com

PAS Sound Engineering, Ltd.
www.pas-sound.co.uk

Phonic Ear
www.phonicear.com

Sennheiser
www.sennheiserusa.com

Shure
www.shure.com