Joetta Sack-Min

Can You Hear Me Now?

If students can't listen, they can't learn. In a number of schools, districts are turning to wireless microphones and other systems to boost sound—and achievement

Beth Wilson recently noticed that her students perk up when they see her loop a cordless microphone around her neck.

"The minute you turn it on, the children really start paying attention," says Wilson, who teaches kindergarten at Charles Ramsey Elementary in Alexandria, Va.

Nearly all the teachers at Ramsey use the wireless devices, which project their voices through a system of four speakers throughout a classroom. The system is designed to spread sound evenly, so that students in the back can hear as well as those in the front row, and even when the teacher has her back to the class. When it's the students' turn to speak, they pass around a handheld wireless microphone.

It seems like a simple—and relatively inexpensive—concept. But preliminary research on acoustical systems in classrooms is also hard to ignore: The better students can hear, the more they may learn.

"We know that students' ability to learn is negatively impacted when the teacher's voice is muddled or blocked by distance, reverberation, and background noise," says researcher Paul J. McCarty, an adjunct education and psychology professor at Brigham Young University in Utah. "And we know that students' desire to learn is diminished when they can't understand the teacher."

McCarty has spent years compiling medical research on children's hearing, conducting environmental research on classroom sounds, and comparing test scores in lower-income schools that had installed systems to others that had not. What he found is that many students—particularly those sitting in the middle or the back of the class—are missing out on lessons because they cannot make out their instructor's voice.

Helping at-risk students

A little-known fact is that the neurological components of a child's hearing do not fully develop until age 15, which means that children can't decipher differences in sounds and comprehend what they hear as well as adults. Further, about 14 percent of children have some degree of permanent hearing loss, and on any given day as many as 20 percent of students have undiagnosed inner-ear infections that result in a mild, temporary hearing loss.

The most at-risk students—those living in poverty, English language learners, and learning disabled students—are the most likely to be missing out, McCarty says. He points to two recent studies that found that children living in poverty received only 20 percent of the early verbal stimulation that their middle-class peers did, which put them at a significant disadvantage when starting school.

In Waushoe County, Nev., school board members, administrators, and teachers are convinced that better acoustics have made a tremendous difference in their students' learning. After board members in 2004 visited a Florida school that used an acoustics system, they decided to invest in such systems for classrooms in several Title I schools.

The district hired McCarty to study the systems' impact. In the first year, he found that third-graders in the sound-controlled classrooms saw gains of as much as 10 percent on state assessments, compared to no gains by students who were in classrooms without the systems.

Waushoe County, which includes Reno, portions of Lake Tahoe, and many impoverished desert communities, is spending about $250,000 annually to add the systems to all of its classrooms, from elementary to high school, says Ken Grein, the district's superintendent of operations. The district has about 100 schools.

"I can't say enough good about it," Grein says. "We're seeing facts, and we have the data to show improvement."

Does it really work?

The Alexandria City Public Schools began installing the acoustics systems in the homeroom classrooms of all of their elementary schools about two years ago. Each classroom system cost about $1,000, which was paid for with E-rate funds, says Mark Krause, the 10,200-student district's facilities director.

"We've been really impressed so far," Krause says. "We've seen a big difference in the classrooms where we've had them installed, and the teachers seem to love them."

The district also is testing the system in two middle school classrooms, and is researching whether the systems have any effect on student achievement.

Regardless of test scores, Ramsey Elementary Principal Karl Smith says he's noticed a positive difference in students' behavior. "The kids are more alert, they pick up more and are more focused," he says.

And, Smith says, most of the teachers have been thrilled with the devices. The only complaints have been related to minor equipment problems, such as adjusting the volume of microphones, but the manufacturer's training helped teachers quickly become comfortable with the technology.

Most students—even the most shy—enjoy using the classroom microphones, Smith says. "For the reluctant student, the microphone really gives them a voice."

But some researchers believe an amplification system could be harmful, or that better alternatives exist.

The influential Acoustical Society of America has issued a position paper stating that it does not support sound amplification systems in classrooms. "Such increased sound levels may be excessive for comfortable listening," the paper states, and could interfere with learning in nearby classrooms. Instead, the organization contends that students would be better served in classrooms designed to keep noise out through insulation and other means.

Some architects also note that future trends in teaching are more likely to be based on individualized, project-based learning instead of teachers lecturing at the front of a classroom.

And Judy Marks, assistant director of the National Clearinghouse for Educational Facilities, points out that a properly designed building should not need an acoustical system. Most new buildings, she says, are designed so that a speaker's voice will easily carry through the entire room.

Enhancing the classroom

Ramsey Elementary, a predominantly minority school that draws many new immigrants and transient students from the apartment complexes that surround its campus, is housed in a well-kept 1960s-era facility. Cordell Richardson, a regional salesman with Audio Enhancements, a Utah-based firm that is installing the systems in Alexandria's schools, says about half of his sales are for new buildings while the other half are retrofits.

A microphone worn around the neck transmits the teacher's voice through a classroom.

Proponents also emphasize that the speaker systems do not merely amplify a voice. Standing in the front of an "enhanced" classroom, visitors don't notice a change in the sound. But from the middle of the room, it's clear that the speaker's voice is being carried through the speaker system.

"What this does is to allow for equal distribution of the teacher's voice so that the kids in the back of room can hear just as clearly as those in the front of the room," Krause says.

The system's other main benefit is helping teachers' vocal health. Researchers at the National Center for Voice and Speech, based at the University of Iowa, found that teachers are at the highest risk level for voice fatigue and injury, and McCarty's research found that teachers spend about 55 percent of their workdays speaking to students. A microphone system can eliminate the problems related to voice levels, although not the duration, the NCVS researchers found.

"After six hours of straining, the teacher invariably leaves school physically exhausted," McCarty says. "Over time, this physical effort takes its toll on a teacher's effectiveness, energy, and enthusiasm."

Several Ramsey teachers report that they have noticed a substantial difference in their vocal cords—they don't speak as loudly and they pay more attention to the tone of their voice. "I was skeptical, but it has helped a lot with voice fatigue," Wilson says.

The systems are also being installed in many schools as part of larger technology upgrades that might also include enhanced lighting and video equipment. The features are included in Microsoft's "School of the Future" in Philadelphia.

Ramsey Elementary also is taking the "enhanced" classroom a step further: It is experimenting with a built-in classroom projector to accompany the acoustical system in its science classroom. Teacher Vesta Nelson directs the camera toward an experiment she is demonstrating, toward animal cages in the back of the room, or to relay lessons on her computer to a large screen at the front of the classroom.

Richardson says his company is receiving many more inquiries about both the acoustical and the enhanced video systems from schools. The more elaborate systems cost about $9,000 for each classroom.

If all goes well, Krause says, the Alexandria district will consider putting the projection systems in other schools as well. "The second system takes it another step further," he says. ■

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