

## The Benefits of Classroom Amplification Technology

*White Paper by Bruce Bebb, Marketing Communications Director, LightSPEED Technologies*

Classroom Amplification Technology has been used effectively to enhance listening and learning environments for more than 20 years. The primary goal of CAT is to provide a high level of speech intelligibility and to evenly distribute sound throughout the classroom. Research, validated by the U.S. Department of Education, is clear, consistent and conclusive...all students benefit from classroom amplification technology.

*"Hearing is the primary channel for learning. The more children hear, the better they learn."  
—Dr. Mark Ross,  
University of Connecticut*

*“Sound systems help level the playing field, allowing every child the opportunity to clearly hear the spoken instruction” —Dr. Carol Flexer, Audiologist, University of Akron*

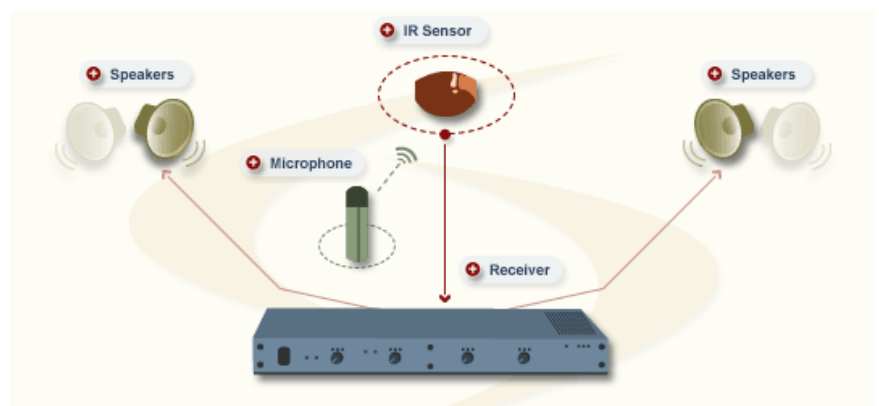
## Introduction

Recent studies have verified that hundreds of thousands of children are academically at risk due to a high incidence of poor classroom acoustics, high ambient noise levels in the classrooms, and mild hearing loss among pre-adolescents (K-6) due to common ear infections. These studies show conclusively that conditions in the majority of current kindergarten through 6th grade classrooms make it difficult for a significant portion of students to hear adequately. These same studies show that many of the children that are not hearing adequately become academically deficient in at least one subject by the 6th grade. The results from the largest study conducted, Mainstream Amplification Resource Room Study or the the MARRS Project (1979–1993), have been validated by the U.S. Department of Education.

All the recent studies validate classroom amplification as a proven tool that can overcome adverse classroom conditions, providing students with enhanced speech recognition and, therefore, much improved opportunity to learn. Sound-field classroom amplification is now recognized as one of the most powerful and cost-effective tools for student listening enhancement.

## What Is a Classroom Amplification System & How Does It Work?

Infrared classroom amplification systems may be installed or portable. They contain similar system components and operate in much the same manner. The teacher wears a lightweight wireless microphone that transmits the signal via infrared light to a receiver/amplifier unit. The voice is then amplified through loudspeakers and distributed evenly throughout the classroom. The amplified teacher’s voice overcomes background noise, poor room acoustics and mild hearing loss to make it easier for students to concentrate on what the teacher is saying.<sup>(1)</sup>



*Infrared classroom amplification has emerged as the perfect technology for delivering clear instruction to all students, mitigating poor acoustics and high ambient noise levels.*

### The Goal of Classroom Amplification Technology

Young children spend 75% of their school day involved in listening activities. Their primary channel for learning is hearing.<sup>(2)</sup> The better children can hear, the more they can learn.<sup>(3)</sup> For maximum learning to occur the teacher's voice must be highly intelligible to every child. Younger children's lack of experience and knowledge with speech and language makes them very dependent on the soft, subtle consonant sounds that make up the key elements of word recognition.

The goal of Classroom Amplification Technology is to enable every child in a classroom to clearly hear all the speech components of the teacher's voice no matter where a child is seated relative to the teacher's position in the room.

*The following benefits of Classroom Amplification Technology is a synopsis of related research projects. Detailed summaries are available upon request.*

### High Ambient Noise Levels Are Easily Overcome

The mix of various noises that make up the ambient noise in a classroom are composed of external noises like street traffic, construction, playground noises; general facilities noises like heating and air conditioning, hallway noises; and classroom noises like furniture movement, children talking, etc. Several thorough studies have measured both occupied and unoccupied classrooms. Quantitative measurements have revealed that occupied kindergarten classrooms can range from 65 to 75 decibels (dB), occupied elementary classrooms can range from 55 to 65 decibels, and occupied high school classrooms can range from 60 to 70 decibels. Since a teacher's voice level drops by 75% for a child 12 feet from the teacher, these levels of ambient noise significantly impair the listening ability of a child seated 12 feet or more from the teacher's position in the room. At these kinds of noise levels critical components of speech are masked and it is not uncommon to have less than 50% word recognition for a K-3 child seated 12 feet or more from the teacher.

Classroom amplification overcomes ambient noise levels and distributes the teacher's voice at the same amplified level throughout the classroom. Every child hears the teacher at the same level no matter where the child is seated.

*Classroom Amplification Technology has been defined as... “A speech intelligibility system that provides clarity of voice and even sound distribution throughout the learning environment.”*  
—LightSPEED Technologies web site.

### 30% of K–6 Children Hear Their Teacher Significantly Better

The U.S. Department of Education has validated in an extensive series of studies (conducted from 1971 to the present) that approximately 30% of any K–6 population will have ear infections and middle ear fluid throughout the school year. These common middle ear conditions produce a mild hearing loss (MHL) of 10 to 20 decibels. Without intervention, 70% of these MHL children will become academically deficient in at least one or more subjects by the 6th grade.<sup>(4)</sup>

The U.S. Department of Education has validated that classroom amplification in the classroom can overcome the hearing loss of MHL children and with classroom amplification these children are enabled to academically perform as well as children with normal hearing.

### Attention & On-Task Time Improve

One of the most common difficulties for children in listening is distraction. A student sees a movement in his peripheral vision, a child at the back of the classroom may hear a chair move next to her as loud as the teacher’s voice. The result in either case may be the loss of a word or a concept. A child’s sensitivity to distractions can vary day-to-day and even hour-to-hour. In addition, the average classroom today will have several children with some type of learning difficulty; one of the most significant is Attention-Deficit Disorder (ADD).

It is now known that classroom amplification can in many cases reduce a child’s sensitivity to distractions. When a teacher’s voice is amplified 5 to 15 decibels above ambient noise, improving articulation and enhancing speech intelligibility, the amplified instruction can better capture a child’s attention and tends to suppress their sensitivity to the normal sounds and movements within the classroom. Teachers using classroom amplification report less repeating of instructions is necessary and fewer reminders are needed.<sup>(5)</sup>

*“In classrooms where students used the microphone to amplify their voices, teachers report increased enthusiasm and desire to read and give oral reports.” —Allen and Patton<sup>(6)</sup>*

### Class Interaction & Participation Increases

Children who cannot hear and understand clearly what they are being asked and told, often lack the confidence to participate in classroom discussion. The MARRS studies show clearly that a significant number of K–6 children cannot hear adequately due to poor classroom acoustics, high ambient noise levels, and high incidence of mild hearing loss. When a child cannot hear instructions well, the uncertainty of what is happening can cause reluctance to being involved.

Teachers employing classroom amplification in the classroom note an improvement in student motivation and participation due to more consistent understanding of what is expected. They also report a marked improvement in responses to questions and requests. In classrooms where students used the microphone to amplify their voices, teachers report increased enthusiasm and desire to read and give oral reports.<sup>(6)</sup>

### Classroom Stress is Lowered & Fewer Behavior Problems

Educational psychologists have known for some time that as a teacher raises his/her voice level, the tension and anxiety among children in the class is heightened. The prime example is when a teacher needs to raise their voice in a forceful manner to get the attention of a child misbehaving in the back of a classroom. All the children feel the stress of such a verbal encounter. It is also well known that a loud, forceful command for some children can have the opposite response to the desired behavior. In general, children are known to respond best to a natural, conversational voice level.

Classroom Amplification allows a teacher to speak in a natural conversational voice level and still be heard clearly. Teachers report a significant reduction in stress within the classroom, fewer behavior problems, better response to verbal correction when necessary and overall easier management/control of classrooms.<sup>(7)</sup>

*“For the first time in my career, I have energy at the end of the day” —Ms. Miyahira 2nd grade teacher, Tigard, Ore.*

### Teacher Absenteeism Due to Voice & Throat Illness Is Almost Eliminated

Voice fatigue and throat infections account for 11% to 16% of teacher absenteeism. Even in a classroom with relatively low ambient noise a teacher must project his or her voice to overcome the normal physics of sound travel through air. The inverse square law of physics defines that for every doubling of the distance from a teacher, their voice level drops by 75%. This means a student seated at 12 feet from the teacher hears the teacher’s voice at less than one-eighth of the level of a child seated three feet away from the teacher. In order to overcome this loss of voice level over distance, many teachers have to project their voices well above a natural and healthy level for their vocal cords. This results in higher than average throat/voice problems for teachers.

With the use of classroom amplification a teacher is able to speak in a conversational voice, all students hear them easily, and most, if not all, voice strain is eliminated. The outcome is that schools using classroom amplification report significantly lower teacher absenteeism (8% to 13% lower) due to voice and throat problems.<sup>(8)</sup>

### Academic Test Scores Improve

The MARRS study clearly proved that classroom acoustics, ambient noise and mild hearing loss have a significant affect on the academic performance for 25% to 30% of K–6 populations. What has been overlooked until recently has been the impact of classroom acoustics and ambient noise on children with normal hearing.

Sound-field studies show that amplifying a teacher’s voice results in exceptional improvement in reading and language test scores for all students at all elementary levels. It has reduced special education referral rates by up to 40% over five years. Some studies have a shown a 7% to 10% improvement in academic test scores for normal hearing children. The statistically significant gains that have been made employing classroom amplification have usually been evident in less than one full school year, and have been maintained in research study periods for up to three years.<sup>(9)</sup>

*“English Language Learners (ELL) increased word recognition skills up to 30% using classroom amplification technology.”— Dr. Carl Crandell, University of Florida*

### Children for Whom English Is A Second Language Can Experience Over 30% Improvement In Word/Sentence Recognition

A 1994 study shows that noise in the classroom has a substantial negative impact on English Language Learners students when compared with native language students. At 18 feet from the teacher the ELL student scores 25% lower than native language children.

A recent study shows that ELL students can score as much as 30% higher on word/sentence recognition tests when classroom amplification is in use. <sup>(10)</sup>

### Children With Other Learning Disorders Can Benefit

Several studies show that children with articulation disorders (5%–10% of all school age children), language disorders, auditory processing disorders, learning disorders, and unilateral sensorineural hearing loss all experience more severe speech recognition difficulties as the voice to noise level decreases (greater distances from teacher). <sup>(11)</sup>

Although there is not as much empirical data to support improvement due to sound-field classroom amplification, improved voice to noise ratios have proven to help many of these children.

### Teacher Survey Shows Classroom Amplification Systems Perceived More Useful Than Most Popular Audio/Visual Equipment

A survey of ninety school teachers ranked the importance of the most popular equipment used in class instruction. The equipment list included: cassette tape player/recorder, overhead projector, television, classroom amplification system, camcorder, TV/VCR combo, and CD-ROM.

Those teachers who had used classroom amplification gave it twice the #1 votes over the next most useful equipment. <sup>(12)</sup>

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Choosing a speaker that produces highly intelligible sound to every corner of the room is important. LightSPEED offers a variety of ceiling and wall mounted speakers that have been designed specifically for the classroom.

### Ceiling Speakers:



CNXQ

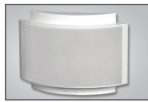


DRQ

### Wall Speakers:



WMQ



CSQ



NXQ

LightSPEED's Classroom Amplification Systems are designed specifically for the learning environment. From the easy one step operation for teachers to the virtually unbreakable LightMic, these systems are built to last.



### REDCAT™ Infrared Classroom Amplification Technology

The REDCAT is an all-in-one system that requires no installation. It can be mounted on the wall like a picture frame, or placed on a bookshelf or desktop. It distributes sound evenly throughout the classroom and is specifically engineered to deliver outstanding voice intelligibility.



### Interface with Multimedia: 850iR

The 850iR is designed for traditional classroom environments that need to amplify multimedia equipment such as TVs and computers, as well as the teacher's voice.



### Advanced Technology Integration: 880iR

The 880iR series is built to integrate seamlessly with other classroom applications and components (TVs, CD/DVD players, etc.). The front panel controls are designed with the teacher in mind, and the back for easy installation and integration.

### Questions?

If you have any questions about Classroom Amplification Technology, or would like to speak with a customer service representative regarding specific classroom applications, please call LightSPEED Technologies at 800.732.8999.

## About LightSPEED

Established in 1990, LightSPEED is the leader in Classroom Amplification Technology. We are passionate about improving the listening and learning environment for every child. Built with the teacher in mind and designed specifically for the classroom, our systems are easy to use and proven to increase overall student achievement—without changing curriculum.

### LightSPEED Advantages

*LightSPEED classroom amplification systems are designed for classrooms of today and tomorrow...*

- Commitment to Student Achievement
- Professional Audio Quality
- Virtually Unbreakable LightMic™
- 5-year Warranty
- No Audio Drop-out, Guaranteed
- Personal Service and Support

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