Linkx
Sound Field Systems

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Clear speech shouldn't be a barrier to learning.

Since the first research project on sound field systems some 20 years ago, there have been more than 50 additional studies testifying to the benefits of class rooms fitted with Sound Field Systems. It has been noticed that children in the amplified classrooms attain higher speech perception and spelling scores, their attention to the teacher is for longer periods of time and they score higher in academic achievement tests than children in non-amplified classrooms.

What is the Science behind a Sound Field System?

As with a magnetic field, sound also weakens by the square of the distance.

The sound wave amplitude drops off by the square of the distance. This is calculated by the distance being multiplied by itself.

For example, the child sitting at a teacher's side one metre away hears very well. The child sitting two metres away hears four times less. Four metres away, eight times less. And if the child is ten metres away 10 X 10 = 100 times less!

From the practical aspect, have you ever had someone talk directly in your ear? It's loud. In the class environment, a child sitting directly in front of a teacher 1-2 metres away, will hear very well while a child sitting at the back of the class may be daydreaming. This is not just experiential. The cause may be based on science.

An experienced teacher will often use this by moving the distracted child near them, allowing the child to hear better and remain focused on the lesson. However, the problem still exists with others who are seated at the back of the room or furthest from the teacher.

These children, at a distance from the teacher are off task, more easily distracted, or looking elsewhere more frequently than those who are closer.

There are several points to consider here:

The Facts

•Children spend 45% of the school day engaged in listening activities

•Children's auditory processes aren't fully developed until their mid-teens

•Even in an acoustically 'good' classroom, children 'receive' 83% of a teacher's voice 'signal' when they sit in the front row; 66% in the middle rows and only 55% in the back row.

•Children do not perform well in noisy environments compared to adults

• The ability to listen in noisy environments is not developed until adolescence

•The average primary school student misses 25% of what a teacher says

Children need a quieter environment and a louder signal in which to learn. Hence this is what Sound Field Systems set out to achieve.

Positive Outcomes

Evidence is continuing to accumulate regarding their positive impact upon literacy, academic accomplishments and classroom behaviour. There is less "acting up" or "tuning out" problems. Classroom systems have been shown to be a cost-effective way of minimising special education referrals and services.

With a high prevalence of hearing loss among indigenous communities here in Australia, sound-field amplification systems are helping many Aboriginal children in the classroom hear their teachers.

According to Professor Harvey Dillon, Director at the National Acoustic Laboratories (NAL), the research division of Australian Hearing, many children are unable to hear their teachers properly due to reverberation and general classroom noise.

"Hearing problems can apply to any child in the classroom, but is particularly common among Indigenous children," Prof Dillon said.

While classroom sound-field systems were initially designed for the "special needs" children, experience has demonstrated that children who hear normally in the classroom are also benefiting. Presumably, while these children have no difficulty understanding the teacher in an un-amplified classroom, they are nevertheless able to do this with much less effort and more certainty in an amplified classroom. Clearly, even children with normal hearing have to hear well in order to learn well!

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What is Sound Field System?

The sound-field system consists of an infrared wireless microphone worn by the teacher, which is transmitted via loudspeakers placed strategically around the room. The system increases the teacher's voice level and also decreases the distance from each child to the teacher's voice, which removes the problems associated with reverberation.

"Sound-field systems offer benefits to children with conductive or mild hearing loss who do not wear hearing aids. They also benefit children with middle ear infection, those who speak English as a second language and those with an auditory processing disorder. Sadly, many indigenous children will have several of these disadvantages at once. Without these sound-field systems, it would be near impossible for children in this situation to hear anything in class," Prof Dillon said.

In an experiment conducted by NAL, the use of sound-field systems resulted in a 41 per cent increase in the rate of attainment of educational indicators during the terms the systems were installed. This was averaged across all children in the classes and across reading, writing and numeracy skills and occurred despite most of the children having no problems with their hearing.

"We anticipate that benefits would be even greater for classrooms that have a higher proportion of children with hearing loss such as those in remote areas," he said.

A study conducted at primary schools in Victoria indicated that 11 per cent of children have a hearing loss of some type in one or more ears at any given time.

So while classroom systems were designed to help "special needs" children, and there is much evidence to support this goal, it is apparent that the benefits to teachers should not be overlooked.

In other recent studies, Teachers noticed increased attention levels among students and a decrease in disruptive behaviour. They also had higher energy levels from reduced voice strain with not having to repeat questions or instructions.

Teachers are also saying that Sound field Amplification is helpful because:

- Students with mild hearing loss can hear and follow instructions more easily
- Students behave better because they know what they're supposed to be doing
- Students are less distracted by outside noises
- Students can concentrate longer and get more involved in activities
- There is less noise in the classroom because students are more on-task.

The research shows that the sound-field systems made a significant difference in terms of the listening and reading comprehension, vocabulary and mathematical skills of the students involved.

What does Sound field Technology do?

- Increases the overall level of the teacher's speech
- Improves the signal to background noise ratio by 8-10dB
- Delivers a constant sound level no matter where the teacher is in the room - even facing the black board.

So Who Benefits?

- Children with fluctuating middle ear hearing loss
- Children of non English speaking backgrounds
- Children with auditory processing difficulties
- Children with ADHD
- Children with learning difficulties

Studies show that all children benefit from hearing the Teacher better because of the improvement in signal to background noise ratio.

There are other benefits too such as:

- It's a cost effective way of improving room acoustics
- Can be used to interface other audio visual equipment within the classroom
- Does not stigmatise children with normal hearing
- Does not require cooperation from the child.

As an additional bonus, the teachers' responses to the systems are almost uniformly positive. They appreciate being able to teach all day without straining their voices. This is not a trivial advantage. In one large scale study, it was found that 20% of the teachers suffered from some sort of active voice pathology, with 70% reporting voice problems in the past that caused them to miss work and that impaired their teaching effectiveness. In two laryngological practices, teachers were the most frequent occupation identified representing proportions of 20% and 16% of the total caseload. Another by-product of this is the rise in OH&S claims made by Teachers.