

# FAQs about ...



# Classroom Acoustics

## 1. What causes high noise levels and other acoustical problems in classrooms?

- Most noise problems are caused by excessively loud heating-ventilation-air conditioning units (HVAC)
- Other noise sources in the classroom include the lights, AV and electronic equipment, pencil sharpeners, aquariums, and children moving about the room and talking
- Street and playground noise from outside the building penetrates classrooms
- Hallway and adjacent classroom noise also infiltrates the classroom.

## 2. Who is at risk for learning problems due to poor classroom acoustics?

Crandell, Smaldino & Flexer (1995) identified the following groups of students as at risk for learning problems in the classroom:

- Children with any hearing loss whether unilateral, bilateral, high frequency, minimal, or fluctuating
- Children younger than age 13
- Children who have articulation disorders
- Children who have language learning problems
- Children who have learning disabilities
- Children who are non-native English speakers
- Children who have a history of otitis media
- Children who have auditory processing disorders

Or, about up to 20% of all school-age children

## 3. What are the effects of noise on hearing in the classroom?

Noise masks speech sounds → decreased speech perception abilities

→ decreased comprehension of information → reduced academic

achievement → increased social-emotional problems

## 4. What are other effects of poor classroom acoustics?

- Increased voice fatigue for teachers (Allen, 1995); Iowa study found highest percentage of teacher absences was due to voice-related problems)
- Students' listening effort increases (Ross, 1992); the more energy put into just trying to hear the teacher reduces ability to focus on *what* is being said
- Developmental factors related to language capacity cause younger children to have more problems than older ones
- Students with hearing impairment listen through a filter created by their hearing loss
  - hearing aids amplify all sounds
  - assistive listening technology improves signal-to-noise ratios
  - assistive listening devices are a necessity for most students with hearing loss

## 5. What actions are being taken to improve classroom acoustics?

- The American National Standards Institute (ANSI) has approved the Classroom Acoustics Standard: ANSI S12.60.2002, American National Standard for Acoustical Performance Criteria, Design Requirements and Guidelines for Schools; the Standard calls for a 35dBA ambient classroom noise level and a .6 second reverberation time for basic classrooms.

- ANSI will propose that the standard be adopted as part of the international building code
- Parent organizations and professionals are lobbying to have the standard included as part of the 2002 IDEA reauthorization

**6. What will it cost to improve classroom acoustics?**

- Retrofitting poorly designed HVAC systems or installing wall, ceiling, or floor treatments costs twice to five times more than proper original design and construction.
- While the cost to provide proper acoustical environments is estimated to raise construction costs by 5%, the benefit-to-cost ratio over time when comparing the educational benefits of improved signal-to-noise ratios is estimated to be 40:1 (Lubman & Sutherland, 1999)

**7. What can be done to increase awareness about the problems associated with classroom acoustics?**

- Obtain information packet from the Acoustical Society of America on the Classroom Acoustics Standard @ [www.asa.aip.org](http://www.asa.aip.org)
- Get together school facilities personnel who are responsible for school facility planning, design, and remodeling along with school audiologists, building principals, teachers, parents, and others who are knowledgeable and/or interested in this problem; also include local architectural firms and acoustical engineers.
- Have a meeting to raise awareness of the problems, discuss the ANSI standard on classroom acoustics, and to develop plans for addressing the problem.

**8. What can teachers and schools do to improve acoustical conditions in their classrooms?**

- Add carpet or rugs to the floor; if this is not possible, put rubber tips or tennis balls on the chair legs or, use cushions in place of chairs
- Put drapes on windows and walls
- Use cork board on walls for bulletin boards to reduce reflective surfaces
- Use bookshelves as room dividers to create quiet classroom spaces
- Landscape with trees and burms to reduce outside noise
- Close doors to hallways
- Suspend acoustical tile
- Make sure lighting is adequate
- Use sound field distribution system to assure that all students have access to the teacher or speaker's voice.

**For more information on classroom acoustics see: [www.classroomacoutics.com](http://www.classroomacoutics.com)**

**References:**

- American National Standards Institute (2002), American National Standard for Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, S12.60-2002.
- Allen L (1995) The effect sound field amplification has on teacher vocal abuse problems. Paper presented at the Educational Audiology Association Summer Conference, Lake Lure, NC, June 1995.
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- Lubman D & Sutherland L (1999) Good classroom acoustics are a good investment for America. Invited paper presented at the 138<sup>th</sup> Annual Meeting of the Acoustical Society of America, Columbus, OH, Nov 1999.
- Ross M (1992) Room acoustics and speech perception. In M. Ross (Ed.), *FM Auditory training systems: Characteristics, selection, & use*, 40-41. Timonium, MD: York Press.