

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
- 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

References:

- American National Standards Institute (2002), American National Standard for Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, S12.60-2002.
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- Lubman D & Sutherland L (1999) Good classroom acoustics are a good investment for America. Invited paper presented at the 138th 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.