

HOW TO REDUCE NOISE IN CLASSROOMS

To improve the acoustics within a classroom:

- **Pinpoint the sources of the noise**
- **Keep noise out of the room**
- **Prevent noise from arising within the room**
- **Decrease reverberations (reverberation time) and noise levels**
- **Increase signal strength (increase speech volume and/or decrease distance to speaker)**

1) Pinpoint the sources of the noise.

Noise can enter the classroom from the outdoors, from adjoining classrooms, from hallways, and from within the room. To pinpoint the major noise offenders, you'll want to start with an unoccupied classroom with all equipment off (including heating and air conditioning). Listen for any noises, pinpoint the exact sources, and one-by-one start turning on the a/c, heating, and the various pieces of equipment in the room, while listening at each stage. If the adjoining spaces are unoccupied, turn on a radio to simulate the noise coming from those areas.

This process is described fully in an excellent recent article by Mike Nixon, an acoustical engineer, "Assessing the acoustics in your child's classroom: A guide for parents"
www.hdhearing.com/learning/mikenixonarticle.htm

2) Keep noise out of the room.

Noise can enter the room from outdoors, from adjoining classrooms, and from hallways.

- Relocate class away from noisy areas such the office or canteen.
- Many rooms have suspended ceilings where the interior walls do not meet the true ceiling. Noise in one room can go up and over the wall to the adjoining classroom. Acoustical tiling will absorb some sound and lower reverberation, but does not really act as a barrier to sound waves.
- If walls are gyprock with an air space between them, fill the space with sound absorbing foam.
- Look for air ducts between classrooms. If they are not being used, close them off or fill them with sound absorbing material. If they are being used, perhaps they can be lined with absorbent material.
- Fix cracks in walls. More noise can enter through a crack 1/16th of an inch wide than through the entire wall.
- Check to see if sound is entering from the bottom of the wall. The wall may not sit firmly on the floor, leaving a very thin gap between the wall and the floor. If so, remove the baseboard and caulk the gap to seal off the sound.
- **Doors**
 - Get a solid-core door. It keeps a lot more sound out than a hollow-core door.
 - Check that the door closes snugly in the frame. If it doesn't, sound can get through. Replace/install weatherstripping.
 - Noise can also enter through the gap under the door. Install weatherstripping or a drop seal.
- Consider carpeting in the hallways and "softening up" hard, flat surfaces.
- Repair windows. Make sure windows are tight-fitting when closed and that rubber gaskets are in good condition and not missing from any areas.
- Use double-pane windows to keep out noises from the outside.
- Hang heavy curtains to cut down on outside noise.

3) Prevent noise from arising within the room.

It is most important to keep noise from arising in the first place. Prevention is easier and less costly than control.

- Thin carpeting on floor subdues scraping sound of chairs and desks and shuffling of feet.
- Rubber tips on chair and desk legs also cut down on the scraping sound. You can also use tennis balls (with slits cut in them) in lieu of rubber tips. Use weatherstripping to prevent surfaces from banging against each other (lowering desktops, for instance).
- Regular maintenance of heating, ventilation, and air conditioning, fluorescent lights, computers, printers and other electrical devices.
- Keep machines turned off when not in use. The cumulative effect can be significant.
- Place machines on sound absorbent pads.
- Minimize the time students are retrieving materials through careful planning and clear directions.
- Lower the reverberations within the room. (Please see next section.) Excessive reverberation increases the general noise level.

4) Decrease reverberations (reverberation time) and noise levels

Excessive reverberations (longer reverberation time) distort words and add to the general noise level.

- Place acoustical panelling on the side walls and particularly the back wall. This will prevent the teacher's voice from reflecting off the back wall and up towards the front.
- If you have high ceilings, install suspended ceilings with sound absorbent tiles. This is one of the best things you can do, for two reasons: it decreases the volume of the room, resulting in shorter reverberation time, and the tiles will absorb rather than reflect the sound.
- Heavy curtains can absorb sounds and keep them from reflecting off the hard-surfaced windows.
- Flat, hard-surfaced objects (bare walls, metal filing cabinets) raise the noise level and the reverberation time.
 - Place large, sound-absorbing objects around the room: bookcases and/or shelving containing objects of different size and textures, corkboards, fabric partitions, and paper pad easels. (Note: large objects should be placed at a slight angle from the wall --10% to 15%-- to break up the pinball effect of sounds ricocheting between parallel walls.)
 - Put up art projects: textured sculptures, mobiles, and fabric wall-hangings.
 - Mount acoustical panels (see above).
 - Remember -- bare walls are a "no-no."

5) Increase speech volume and/or decrease distance to speaker

To hear more clearly, we can also move the students closer to the teacher or make the teacher's voice louder. In either case, this would have the effect of raising the signal strength.

- Think of rearranging the furniture so no one is more than 5-7 metres from the teacher. When someone is speaking, make sure they don't turn their backs to the students. This cuts the volume in half.
- Consider using a sound field system. This is actually a sound equalization system. The teacher wears a lapel microphone and a portable, beltclip transmitter. Her voice is broadcast to wall or ceiling-mounted speakers so everyone can hear her equally well. (NOTE: If excessive reverberation is a problem, you should not use this technique as it may make the reverberations worse. First, get the reverberations under control. Then consider this type of system.)
- For students with hearing loss, the teacher can use a personal FM system in conjunction with a sound field system or by itself. Wearing a lapel mike and a small, beltclip transmitter, her voice is transmitted to a portable receiver worn by the student and pumped directly into his ear.