CHAPTER 5

How to prepare the classroom for a child with a cochlear implant

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Physical environment

Why are classroom acoustics important?

It is ironic that classrooms and other educational spaces are among the least friendly listening environments for children with hearing loss. Background noise from heating and ventilation systems, activities in adjacent classrooms and hallways, and even noise inside the classroom from the children themselves (particularly from chairs moving) combine to create ambient noise levels that typically reach 40 to 50 decibels and can go even higher. The fact that most classrooms have tile floors with few sound-absorbent materials on walls and windows makes these spaces highly reverberant, exacerbating the noise problems.

Assistive listening systems can be helpful in overcoming poor acoustics, but even these technologies can be compromised by high levels of background noise and reverberation in the classroom. If a child is using a wireless personal FM system such as Phonak’s Microlink or Oticon’s Amigo, the FM input for the child’s cochlear implant is generally set for mixing. Mixing means that the child’s microphone will pick up classmates’ voices and the child’s own voice—as well as the teacher’s voice (which is given more “preference” in the mixing proportion). If the room is noisy, the ambient sounds (i.e., the noise) will make it difficult for the child with a cochlear implant to hear the other children’s voices, picked up via the child’s microphone—not the FM system—and may even spill over and degrade the quality of the FM signal. Additionally, one-on-one and small group interactions in the classroom are often conducted without FM. Thus, a noisy environment will make it difficult for the child to participate in these less-formal classroom activities.
What are the components of classroom acoustics?

Ambient Noise Level. Given in decibels, this is the level of background noise in a room. Background noise is measured in an empty classroom (no children in the room) with all of the noise-generating systems turned on that are typically operating during the classroom day. For example, the heating or air conditioning should be turned on and other equipment that generates noise should be working. Although it is generally agreed that ambient noise levels in classrooms should be no more than 35 decibels, typical levels are much higher.

Sound Pressure Level of the Speech Signal. Although there are many speakers in a classroom, the sound pressure level of the speech signal is typically defined as the teacher’s voice and is measured at the student’s ear. The sound pressure level will be impacted significantly depending on whether or not the teacher is using an amplification system. Preferential seating will help to provide a favorable level, but it is difficult to attain a consistently high sound pressure level without an FM system.

Signal-to-Noise Ratio (SNR). Though termed a “ratio,” the SNR is not a ratio but rather is the difference between the speech signal and the ambient noise level. Thus, if the sound pressure level of the speech signal is 60 decibels and the ambient noise level is 50 decibels, the signal-to-noise ratio would be 60 minus 50 or 10. Children with hearing loss need a SNR of at least 15 decibels, but it is not unusual to find classrooms with negative SNRs—meaning that the ambient noise levels are actually louder than the teacher’s voice.

Reverberation. Reverberation refers to the extent to which sound bounces off the various surfaces in a room (e.g., ceiling, floor, walls, windows), causing multiple signals (from the same sound source) to reach the ear. Reverberation is measured in seconds and is defined as the time it takes for a sound to decay 60 decibels. If a room does not have absorptive surfaces such as carpeting on the floor, soft materials on the walls and acoustical tile in the ceiling, the room is likely to have a higher reverberation rating. Higher reverberation causes the sound signal to smear and impedes listening for children and anyone with a hearing loss. It is recommended that the reverberation time in a classroom not exceed 0.6 seconds. The size of a room (smaller rooms generally have lower rates of reverberation than larger rooms) and its configuration and/or shape can also impact on reverberation. Sometimes acoustical panels can be installed to improve reverberation in a classroom. Temporary classrooms such as trailers often have high levels of reverberation and should generally not house children with hearing loss.
What should we aim for in classroom acoustics?

In 2002, the American National Standards Institute (ANSI) approved a comprehensive standard for classroom acoustics that was developed by an interdisciplinary group working with the Acoustical Society of America and the U.S. Access Board. The standard is referenced as ANSI S12.60-2002 and is available in its entirety (free) online at http://asastore.aip.org. The standard covers both background (ambient) noise and reverberation. Specifics of the standard are:

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<th>Background Noise</th>
<th>Max Reverberation</th>
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<tr>
<td>Classrooms and COR Learning Spaces of 10K CuFt</td>
<td>35dB</td>
<td>0.6 sec</td>
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<tr>
<td>Classrooms and COR Learning Spaces of 20K CuFt</td>
<td>35dB</td>
<td>0.7 sec</td>
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<tr>
<td>Ancillary Spaces</td>
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Suggestions for improving classroom acoustics

• Close the classroom door to avoid ambient noise from hallway activities.
• Hard, reflective surfaces should be covered with sound absorbing materials such as acoustic tiling, cloth, paper, carpeting or cork. Windows should be curtained and floors carpeted.
• If carpeting is not available, chair feet can be padded to reduce noise from movement.
• Use cork or felt pads to reduce noise from desktop opening and closing.
• Noise baffles placed in air ducts reduce unwanted noise.
• Ensure optimal placement of sound field speakers.
• Seat the child in an appropriate spot to facilitate participation and optimal hearing in the classroom.

Static electricity and cochlear implants

Static electricity is the accumulation of electric charge on a person or object and is common in many environments. Static electricity generally occurs when there is friction between two materials — for example — when fabric rubs against plastic when a child uses a plastic slide or when someone takes off a coat made of synthetic material.

Static electricity becomes noticeable when it produces “static” or electrostatic discharge (ESD). Certain levels of static electricity, when discharged, can damage electronic devices. Since a cochlear implant system is an electronic device, it is important to understand the relationship between it and static electricity.
All modern electronic systems, including Nucleus® cochlear implants, incorporate features to protect against ESD damage. The newer sound processors are better protected against ESD. Despite current protective features, there is still a very small chance that ESD may interfere with the performance of the cochlear implant sound processor.

Following are a few tips that can help minimize ESD in the child’s environment:

1. **Identify sources of static electricity in the classroom such as carpet, clothing, mats, plastic play equipment, computer and television screen etc.**
2. **Use humidifiers to decrease the potential for static electricity build up.**
3. **Before handling cochlear implant equipment, touch another surface to discharge any static electricity build up.**
4. **Ensure that all the cables of the child’s cochlear implant sound processor are under clothing.**
5. **Use anti-static spray, dryer fabric softener sheets or a fabric softener spray and water solution on the child’s clothing and carpeting in the room.**
6. **Consider using an anti-static shield over computer monitors and anti-static mats under the computer chair, keyboard, and mouse that a child with a cochlear implant will use.**
7. **Use ESD mats where appropriate.**
8. **Anti-static wristbands are now commercially available and may be effective in dealing with ESD. These wristbands are said to ground the child by the use of an attached “alligator” clip. Anti-static wristbands are relatively inexpensive and are available at retail stores or from manufacturers that sell computer components and parts.**

**Social environment**

Top tips for talking to a child with a cochlear implant

*(Source: Marilyn W. Neault, Ph. D., Children’s Hospital, Boston, MA)*

1. **Speak with natural inflection but not too fast.**
   Slow your rate of speech a bit and use appropriate pauses. Use a nicely projected voice but do not shout.

2. **Start with a couple of “gearing up to listen” words** because the child may miss the first few words when you begin to speak. For example, “Now children, put your toys away.” may work better than, “Put your toys away.” It may take the child a few words to tune into your voice.

3. **Use visual cues.** Get the child’s attention, then speak, then use visual reinforcement, then sign the message if appropriate, then say it again. This will give the child a second opportunity to receive the message auditorily after the meaning is clearly established.

4. **Become highly aware of nearby background noises.** Try to speak in a quiet lull between coughs and clatters. If your speech is over-run by a nearby, unexpected noise or multiple talkers, repeat or rephrase it in a natural way. Seat the child away from obvious sources of background noise such as a door that is opened frequently, noisy heating unit, bubbling aquarium, or children chattering in a work area of the classroom.
5. If the room is noisy, encourage the child to look at you as you speak, particularly if you are not using an FM system. To facilitate lipreading, keep your hands, book and other items away from your face when you speak. Do not exaggerate lip movements.

6. Seat the child near you, not at the back of a group, for group listening activities. If the child needs to hear a person near him or her, seat that person on the side of the cochlear implant. Seat children in a circle or horseshoe arrangement for discussions.

7. Allow the child to rephrase directions to him/herself before doing a task independently. Tactfully, make sure that the child has understood the directions by listening to his/her rephrasing or by observing as she begins the task. Avoid asking, “Did you hear me?” or “Did you understand me?” This is a difficult question to answer since the child will not know whether (s)he heard correctly or missed something that was said.

8. Rephrase—don’t repeat the same words. If the child does not understand what was said the first time, say it a different way the second time. Show that you are pleased when the child asks for clarification.

9. Repeat or rephrase questions and comments posed by another student. When another student asks a question or makes a comment, repeat or rephrase it to the group before responding or calling on the next student.

10. Point out distracting sounds. Help the child to identify and listen to any new distracting background noise so that (s)he has a better chance of being able to ignore it. Remember that a child using a cochlear implant cannot tell what direction a sound is coming from.
Tips for children
(Source: Valerie M. Frigo & Karen K. Stein of The Moog Center for Deaf Education)

Below are some tips that are helpful for the child with a cochlear implant in your classroom. These tips are a great way to encourage positive relationships and set appropriate expectations when the child first arrives in a mainstream class.

1. **Raise your hand.** Remember to raise your hand when you want to talk. When you raise your hand, the teacher knows you are listening and want to learn. You’ll have to wait your turn since there are many students in your class. Sometimes you might not get called because not every one can have a turn every time.

2. **Ask lots of questions.** Ask the teacher questions if you don’t understand what (s)he or the other students said. You can say…..
   - Could you please say that again?
   - Excuse me, what did you say?
   - Could you please talk a little slower?
   - I didn’t understand what you said.
   - Will you help me, please?
   Sometimes you can wait and ask the teacher questions after (s)he is finished talking. Then you can raise your hand and the teacher may come to your desk.

3. **Read directions carefully.** Always read all the directions carefully. If you don’t understand the directions or what you need, you can say…
   - I don’t know what to do.
   - When is my homework due?
   - What should I do first?
   - Am I doing this right?
   Wait until the teacher is finished talking to read the directions. If you read the directions while the teacher is talking, you might not understand what to do.

4. **Make sure you can hear.** Check your implant and FM before school starts. Be sure to have extra batteries with you at all times. Make sure your teacher has an FM microphone. If you can’t hear well, tell the teacher so (s)he can help you.

5. **Make new friends.** Making new friends is a fun part of going to school. Make friends with other students by being nice, helpful and friendly. A “buddy” can help you if you don’t hear something or if you have a question. Sometimes you can ask your “buddy” for help instead of the teacher.

6. **Be patient.** If someone doesn’t understand what you say, then try again. To help someone understand, you can…
   - Repeat what you said.
   - Use your best speech. Slow down.
   - Say it in a different way.
   - Ask a question.
7. Explain how it works. If someone asks you about your cochlear implant, hearing aid or FM, explain how it works and how it helps you. The person is curious and wants to know more about you. You can say…

*My implant helps me hear.*

*The FM makes the teacher’s voice louder and clearer.*

8. Ask for help. If you need help in your school there are lots of people who can help — your parents, your teacher, your “buddy”, the school counselor, a tutor, a resource teacher; a speech-language therapist, an interpreter and a real time captioner.

Tips for friends

(Source: Valerie M. Frigo & Karen K. Stein of The Moog Center for Deaf Education)

Below are some tips to orient other children in your classroom to the child who has a cochlear implant. Going over these tips with your class will help set up a “buddy” system for the child with a cochlear implant and a conducive social environment in the classroom and school. Finding a “buddy” is a good way to be sure that the child always knows what is going on and can participate in all activities.

1. **Speak clearly and directly.** Slow down and speak clearly when talking to the child with a cochlear implant. You don’t have to exaggerate or shout as this makes it difficult for the child to understand what you are saying.

2. **Be close to the child when you are talking to him/her.** Hearing devices work best when your friend or classmate is within 18 inches of you. The further away the child is, the weaker the signal, and the more difficult it is for the child to hear and understand what you are saying.

3. **Get the child’s attention.** Be sure the child is paying attention before you begin speaking. You should always try to call his/her name, tap him/her on the shoulder or signal in some way so that (s)he makes eye contact with you.

4. **Stand still when you talk.** It is very hard to understand you when you are moving. When you are speaking, stand still and face your listener. If you need to demonstrate something, explain first, demonstrate without talking, then repeat the explanation.

5. **Use natural gestures.** Use familiar and natural gestures to demonstrate directions. Additional cues are extremely useful in helping your friend or classmate understand you.

6. **Be sure the child is listening and looking when you are talking.** While hearing children can listen without looking, a child who is deaf may have difficulty following what is said if (s)he is not able to see your face.

7. **Repeat important words and phrases.** Repeating words gives the child a second chance to understand the message. It also helps identify what is important.

8. **Direct the child’s attention to the person speaking.** When someone else is talking, direct your friend or classmate’s attention to the speaker before he or she begins by pointing or saying the person’s name. It may be helpful to repeat what has been said directly to the child, particularly if you are at a distance, or if you begin talking before the child knows who is talking.