Classroom Listening Devices

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Topics

• The Problem
  ◦ Noise
  ◦ Distance
  ◦ Reverberation

• FM Systems

• Loop Systems

• Sound Field Systems
Classrooms are big, **NOISY** places!

- **Outdoor**
  - Traffic, trains, airplanes
  - Playgrounds, playing fields
  - Lawn mowers

- **Indoor**
  - Heating system, air-conditioning system
  - Computers, printers, projectors
  - Hallway noise
  - Noise from other rooms
  - Children talking
  - Feet shuffling
  - Banging on desks
  - Chairs scraping the floor
  - Teacher moving from front to back of the room; faces the board
The Problem

- **Noise and Distance:** Signal-to-noise ratio

http://www.hearingjourney.com/Listening_Room/Teens_and_Adults/Listening_Playbook/Listening_Strategies/index.cfm?langid=1

Children need the speaker’s voice to be 15 to 20 dB above the noise. Most classrooms offer a s/n ratio of 0 dB or worse. The only solution is to reduce the noise in the classroom and have the teacher wear an FM system.
The Problem

- Reverberation: Distortion

http://www.hearingjourney.com/Listening_Room/Teens_and_Adults/Listening_Playbook/Listening_Strategies/index.cfm?langid=1
Personal frequency modulation (FM) systems are like miniature radio stations operating on special frequencies assigned by the Federal Communications Commission.

- The personal FM system consists of a transmitter microphone used by the speaker and a receiver used by the listener.
- The transmitter sends the sound to the receiver through the airwaves.
- The receiver sends the sound to a hearing aid or cochlear implant through a special connector.

**Purpose**
- To bring the important signal (teacher’s voice) to the student without unwanted sound mixed in (background noise)
Student Receiver
(audioshoe)

Optional adaptor

Synchronisation

Aligning the channels on a pupil's receiver is simple. The teacher can discretely set each individual's receiver by sending a control signal from the SCOLA teach.

Teacher microphone/transmitter
1. Children’s discussion is transmitted to teacher’s unit

2. Teacher’s unit transmits children’s discussion to deaf students’ hearing aids

Virtually all audio-visual sources are supported by the SCOLA transmitter via a jack socket. This allows pupils to receive a direct noise-free signal from the multimedia source in parallel with the signal from the teacher.
• Considered to be "reasonable accommodation" by schools in the US

• Sometimes loaned to students for the school year

• Often used in theaters, churches, museums, public meeting spaces
General advantages of FM Systems

- Student hears your speech as if you were just inches away from his/her ear
- Distracting noises and voices are minimized
- Teacher has no microphone cord to drag around
- Portable
  - Can follow student around to different classes
  - Useful on field trips, at home
- Can use several channels in the same room at the same time for multiple, simultaneous small group instruction
Disadvantages of FM Systems

- May receive occasional interference from outside radio transmission
- Must coordinate channel number to avoid jamming other nearby FM systems (50-200 ft in any direction)
- Must remember to turn off transmitter when finished
- Must remember to re-charge batteries overnight
- Different makes and models of FM may not be compatible
- Older systems might require student to use extra wires for connection to hearing aid (and wires can break)
Disadvantages of FM Systems (cont’d)

- Some systems are expensive
- Different activities may require different FM set-ups
  - Student discussion
  - Traditional teacher lecture to entire class
  - Two learning groups, one with teacher and one with teacher aide
Using FM wisely

- Place the transmitting microphone in the right place
  - On teacher’s lapel
  - Near the source of the most important signal
- Teach students to select the best hearing aid setting
  - To hear only the teacher:  T (telecoil)
  - To hear the teacher, and his own voice, and other students during a discussion:  MT ( = mic + telecoil)
  - May defeat the purpose of the FM system unless the students are quiet and take turns
Students say…

- Remember to turn **on** transmitter while teaching
- Wear microphone correctly (6-8 inches from mouth) or use a head-mounted mike (better!)
- Take a minute to check if the student is hearing you

- Do not play with the antenna
- Avoid wearing jewelry that can hit the transmitter
- Remember to turn the microphone off for private conversations
Students say…

- Alert substitute teachers to wear transmitter
- Use during audio-visual presentations (e.g., movies)
- Use on field trips
- Explain to hearing students in the class how the system works
Solution #2
Loop Systems

- Audio output is fed into a loop of wire placed around room perimeter
- Electromagnetic energy is picked up by a coil in the hearing aid (telecoil)

http://www.assistiveaudio.com/facts.htm
Loop Systems

• Advantages
  • Simple set-up
  • Inexpensive
  • Unobtrusive
  • Low maintenance

• Disadvantages
  • Installation can be inconsistent
    • Dead spots
    • Listener must find a good position inside of the loop
    • Can restrict classroom arrangement
  • Loop's magnetic field may spill over into next room
  • Listeners must have a telecoil in their hearing aid
  • Not portable

• Remember: Once the hearing aid microphone is turned on, the benefit of improved S/N ratio is erased
Solution #3
Sound Field Systems

- Teacher's microphone signal is transmitted via FM to an amplifier, which drives wall- and ceiling-mounted speakers.
Sound Field Systems

• Advantages
  ◦ All students benefit because everyone can hear the teacher better
  ◦ Teacher’s voice is saved
  ◦ Easy to convince administrators and teachers to purchase and use
  ◦ No extra wires or devices needed by students

• Disadvantages
  ◦ Not portable; can't follow student around to different classes
  ◦ Compared to FM, the signal-to-noise ratio is not as good for various positions in classroom
The Problem
- Noise
- Distance
- Reverberation

FM Systems
Loop Systems
Sound Field Systems