Classroom Listening Devices

Carol De Filippo

Viet Nam Teacher Education Institute

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Topics

- The Problem
  - Noise
  - Distance
  - Reverberation
- FM Systems
- Loop Systems
- Sound Field Systems

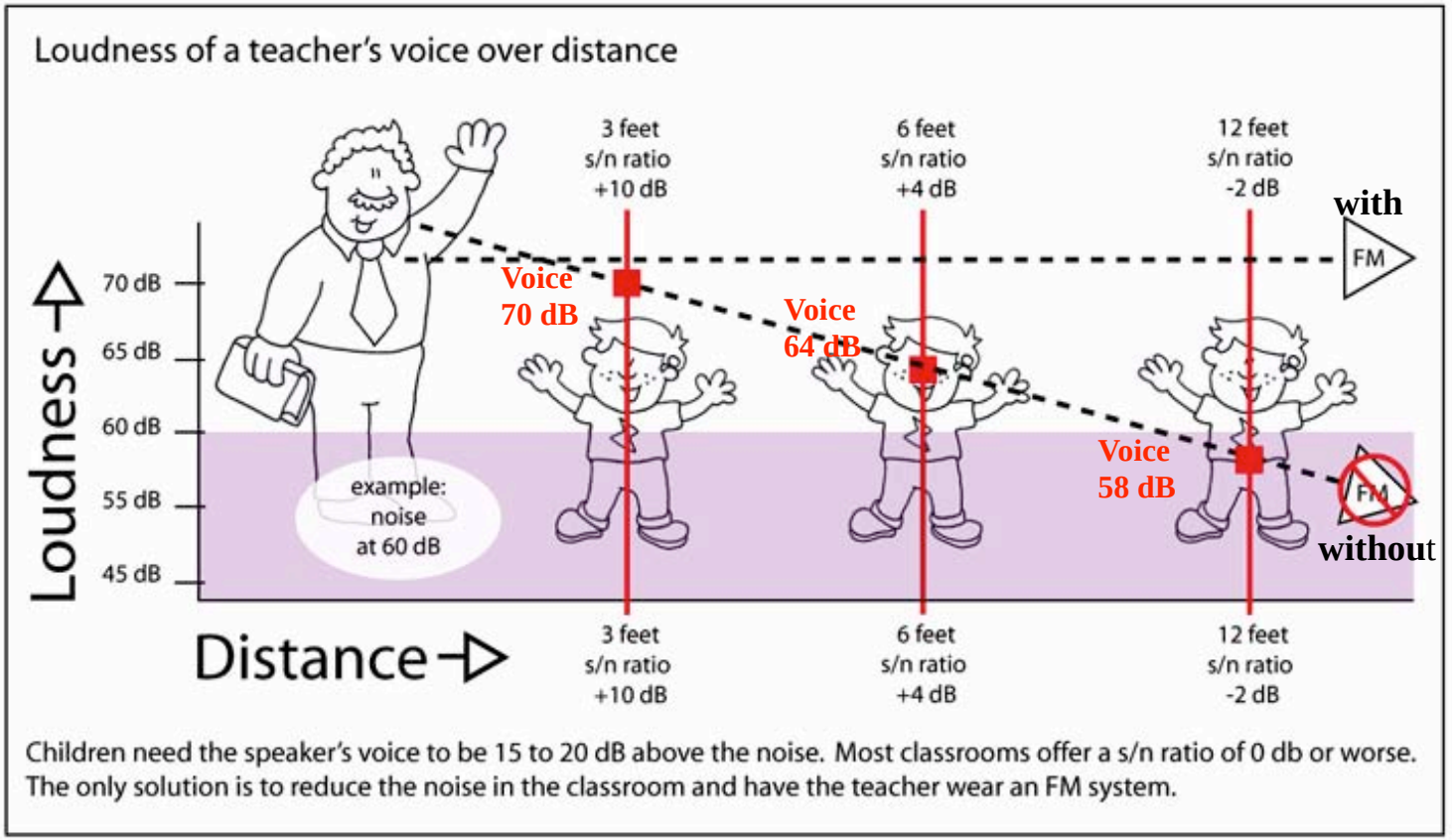
The Problem

- 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

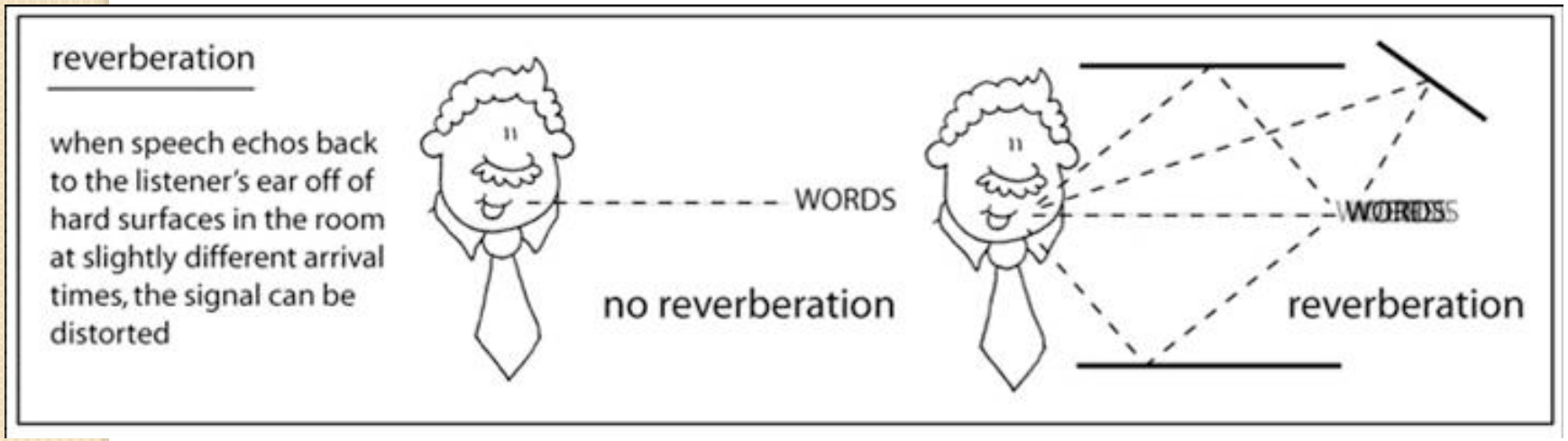
- Noise and Distance: Signal-to-noise ratio



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

The Problem

- Reverberation: Distortion



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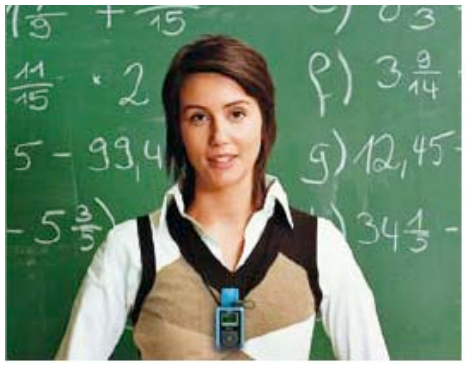
Solution #1
FM Systems

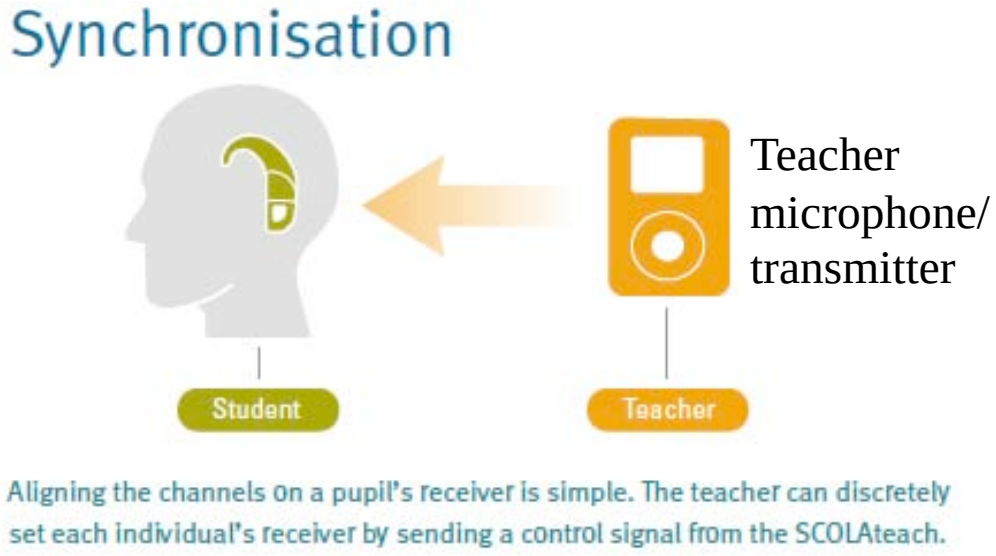


- **Personal frequency modulation (FM) systems** are like miniature radio stations operating on special frequencies assigned by the Federal Communications Commission.
  - The personal FM system consists of a transmitter microphone used by the speaker and a receiver used by the listener.
  - The transmitter 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)

http://www.widex.pro/Products.aspx

Student Receiver
(audioshoe)

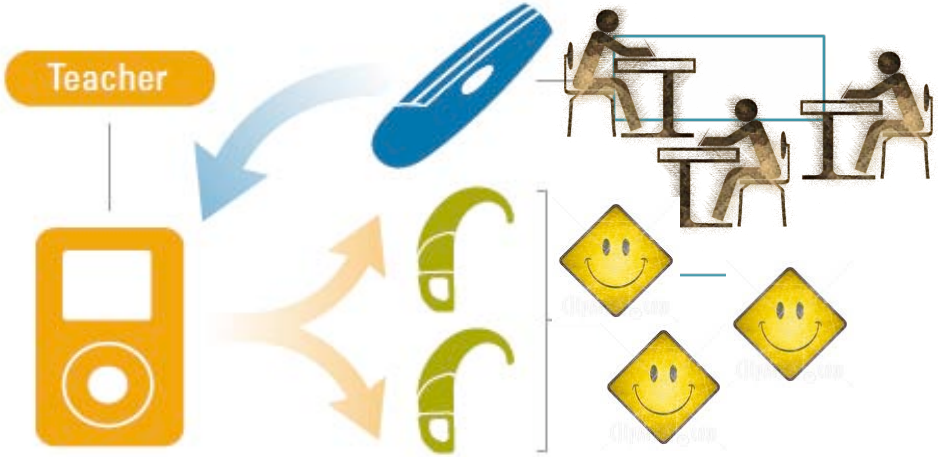
Optional adaptor



http://www.widex.pro/Products.aspx

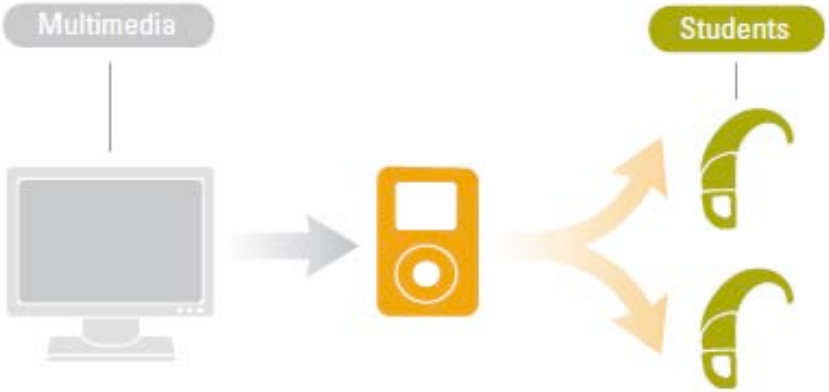
Team Teaching

1. Children's discussion is transmitted to teacher's unit



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

Multimedia support



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

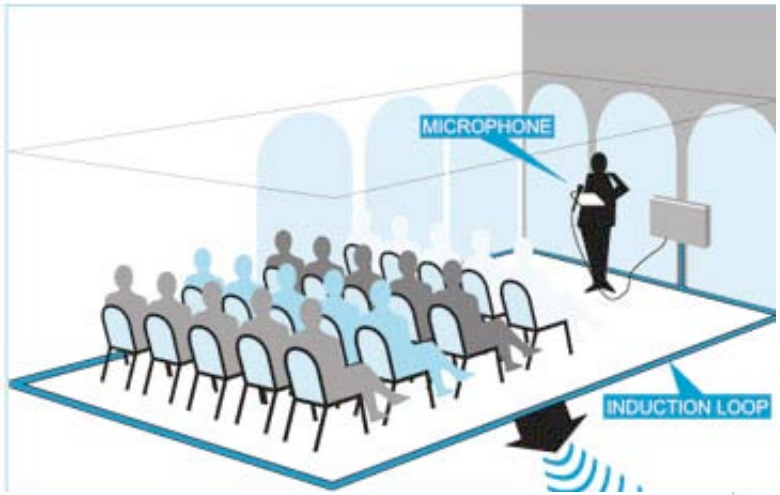
- Do not play with the antenna
- Avoid wearing jewelry that can hit the transmitter
- Remember to turn the microphone off for private conversations

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)



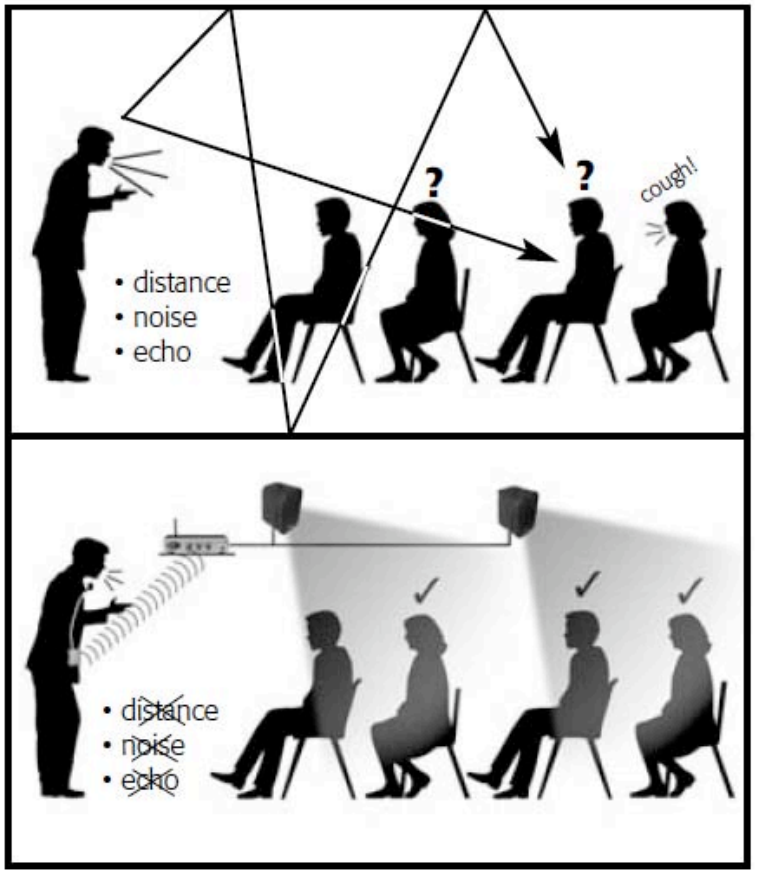
http://www.assistiveaudio.com/facts.htm

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



http://gofrontrow.com/support/product-guides#tabs-2

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

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  - Distance
  - Reverberation
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