

Understanding and Overcoming Listening Challenges When Schools Reopen

June 24, 2020

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Agenda

- Acoustic Accessibility in our New World: Why Listening is Foundational to Learning
- Listening Considerations When Schools Reopen
- Audio Solutions for Classroom Reopening Challenges

Our Speakers



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Acoustic Accessibility in our New World: Why Listening is Foundational to Learning

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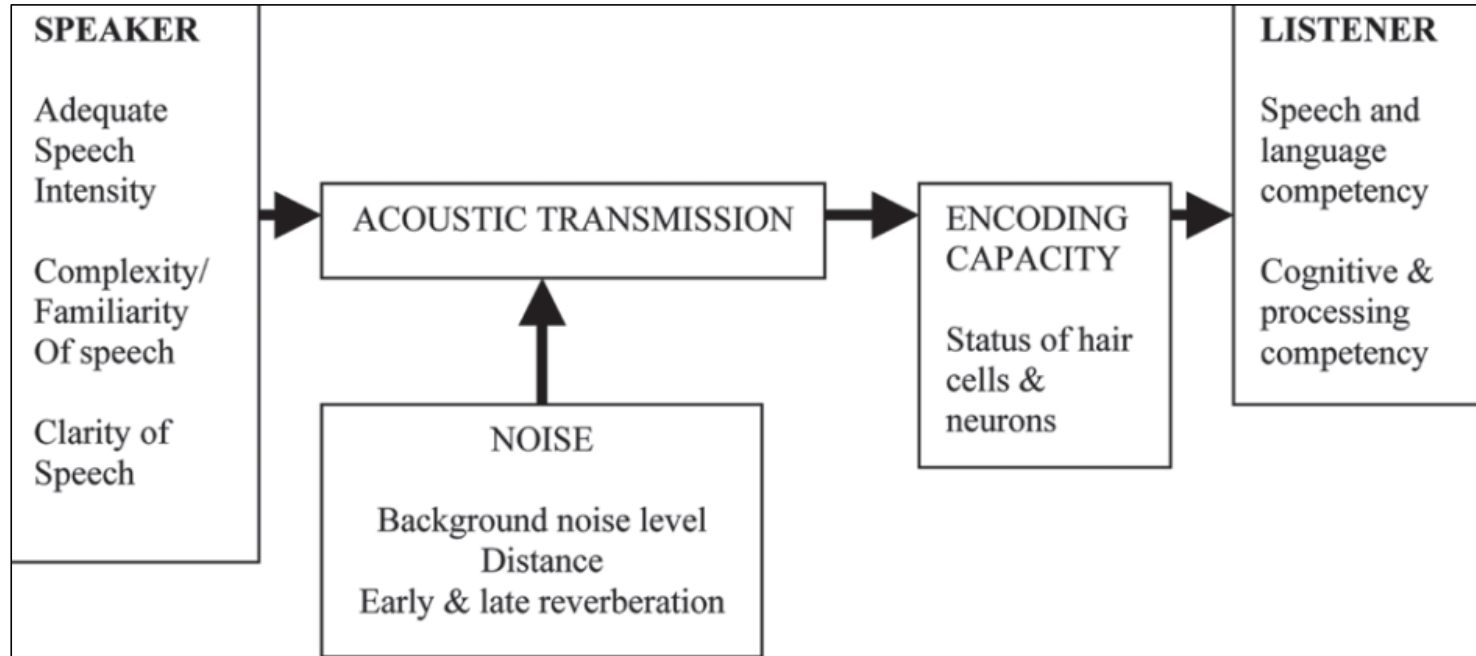
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What is the Problem?

- Poor/average room acoustics can negatively impact speech audibility....and what about masks?
- Reduced speech audibility can decrease speech perception/word understanding.
- Reduced audibility/understanding will increase listening effort and decrease cognitive resources for comprehension.
- Lack of clear, easy auditory brain access to auditory information drains a child's cognitive reserves and dilutes communication and learning.
- For children the end result will be high risk for a slower pace of learning.

Basic Information Transfer Model From Brain to Brain



Information Transfer: The Point

Any of these variables can influence the adequacy of the communication between speaker and listener and can occur in a multitude of combinations.

The acoustic characteristics of the room mainly determine the sufficiency of the speech signal received by the listener.

For children, research has demonstrated that inappropriate levels of classroom noise or reverberation can compromise not only speech perception but also reading scores, spelling ability, behavior, attention, and concentration in children with normal hearing and are even more deleterious to children with hearing loss or children who are at risk for literacy and learning problems.

Hearing vs Listening

- **Hearing** is acoustic access to the brain – brain perception of auditory information; it includes improving the signal-to-noise ratio by managing the environment and utilizing hearing technology.
- **Listening** is attending to acoustic events with intentionality – activating the pre-frontal cortex and direction of cognitive resources to auditory information.
 - The intent of listening is, “Pay attention to auditory information!”
- **“Hearing” must be made available before “listening” can be taught.**
- **We must know about the “hearing thing” before we can do the “listening thing”.**
- **The concept of Extrinsic vs. Intrinsic redundancy.**

Extrinsic vs Intrinsic Redundancy: A Key Concept

(James Jerger)



Extrinsic redundancy refers to the integrity of information from outside the person....."bottom-up" sensory input.



Intrinsic redundancy refers to the cognitive capacity -- the internal knowledge and attentional resources of the person....."top-down" processing.



There is an inverse relationship between these two concepts that must be considered for each child.



Specifically, children do not have the top-down capabilities available to adults.

**Improve
Intelligibility of
our Spoken
Communication
to Enhance
“Bottom-Up”
Sensory Input –
Use a Remote
Microphone and
Speak Slower –
especially when
wearing a mask!**

Most adults speak faster than most children (and many aging persons) can process (often faster than 200 words per minute – way too fast!).

Use “clear speech”....slow down (aim for 124 words per minute, like Mr. Rogers)....pause...use appropriate suprasegmentals to enhance meaning.

The talker’s use of “clear speech” can improve the listeners speech discrimination by up to 40%.

Use remote microphone wireless technology (RM) to improve the SNR.

These are critical ways to enhance extrinsic redundancy.

The following populations require a *greater extrinsic redundancy to facilitate “bottom-up” input!*

- Typical children.
- Children with any type and degree of hearing problem including ear infections and unilateral hearing loss.
- Children with auditory processing problems.
- Children with learning disabilities.
- Children with attention problems.
- Children with behavior problems.
- Children with developmental disabilities.
- Children with visual disabilities.
- Children whose first language is not the language of the speaker.
- *Children who need to catch up on learning.*



Audibility And Intelligibility Distinctions:

The Invisible Classroom Listening Problem

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There is a critical
distinction between speech being heard as ***AUDIBLE***
....versus speech being heard as ***INTELLIGIBLE***

AUDIBILITY means that the speech is “heard” – but not heard clearly enough to distinguish specific speech sounds.

AUDIBILITY is carried by vowels – high energy, low frequency speech sounds. The low frequencies of 250 Hz and 500 Hz carry 90% of the power of speech, but only 10% of the intelligibility.

INTELLIGIBILITY means that the listener heard clearly enough to identify critical word/sound distinctions.

INTELLIGIBILITY is carried by consonants – low energy, high frequency speech sounds.

The frequencies of 2000 Hz and 4000 Hz carry 90% of the intelligibility of speech, but only 10% of the power of speech. They are very weak speech sounds.

Speech Intelligibility Depends On:



The level of the talker's voice



The level of the listener's hearing



The distance between talker and listener



Any intervening objects (such as masks or face shields) or reflections that interfere with the talker's speech

Three Main Take-Away Messages

- 1) Hearing/learning occurs in the brain.
- 2) Auditory information needs to get to the brain for learning to occur (hearing) – and a child needs to pay attention to that information (listening).
- 3) Lack of clear, easy auditory brain access to instructional and social information drains a child's cognitive reserves and dilutes literacy and learning – so, *increase extrinsic redundancy*.



Thank you for Listening

Let's Please Make Sure our Children Can!

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Listening Considerations When Schools Reopen

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CDC Guidance for Opening of Schools

- Promote Healthy Hygiene Practices
 - Teach and Reinforce Washing Hands and covering coughs and sneezes
 - Teach and reinforce use of face coverings among all staff
 - Worn by staff and encouraged by students
 - Cloth masks (how to use, remove, and wash)
- Adequate supplies for healthy hygiene (soap, sanitizers, paper towels, etc.)
- Increased ventilation (possible opening of doors and windows)
- Promote social/physical distancing
 - Seated on same side of table, desks apart, etc.

<https://www.cdc.gov/coronavirus/2019-ncov/community/schools-day-camps.html>



The Balancing Act

- Safety and Health for COVID19
- Ensuring access to the curriculum for ALL Learners
- Free and Appropriate Education (FAPE)
 - IDEA
 - 504
 - ADA

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Increased Learning Demands with COVID19

Auditory Factors

- Degraded speech with mask
- Diminished speech reading/facial cues
- Background noise
- Reverberation
- Speaker-listener distance and directionality
- Listening fatigue
- Online learning demands

EVERY Student is at risk from degraded speech and physical distancing

The following populations require a *greater extrinsic redundancy to facilitate “bottom-up” input!*

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Don't forget our Teachers

- Online? Face-to-Face? Hybrid
 - Accessible Auditory and Visual Access
- Masks
 - Muffled speech
 - Loss of full facial expressions
 - Increased vocal strain
- Physical Distancing results in less audibility of teacher/peer voice
- Health, Safety, Hygiene

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Masked Out



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Amplified Barriers for Students with Hearing Challenges



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Final Takeaways



Safety, health, and accessibility



All students will experience amplified hearing and listening challenges in the classroom, especially students who are deaf/hard of hearing



Think ahead through the Listening Lens

Audio Solutions for Classroom Reopening Challenges

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Listening in the Learning Environment

- Students spend 70-80% of their time in a listening activity
- There is a difference between Audibility vs Intelligibility
 - Impact on language acquisition
 - Impact on literacy skills and future academic achievement
- Facials Masks will have a major impact on learning
 - Degrades speech intelligibility
 - Diminish speech reaching and access to facial cues



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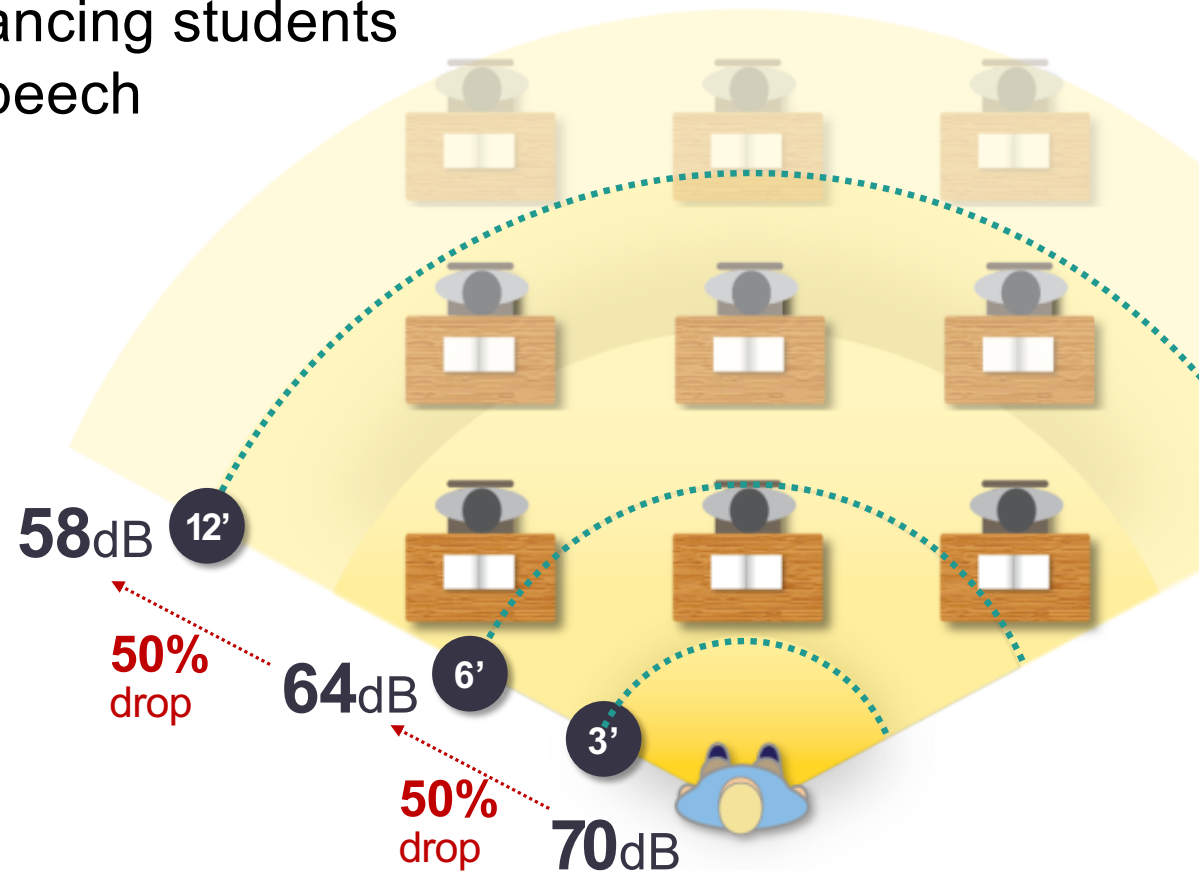
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Every child should
clearly hear every word
from anywhere
in the room and even
from remote locations

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With Noise and Social Distancing students lose access to intelligible speech

- Intelligible speech needs to be +15dB above background noise.
- Sound intensity is reduced approx. 50% each time the distance doubles



Instructional and Classroom Audio

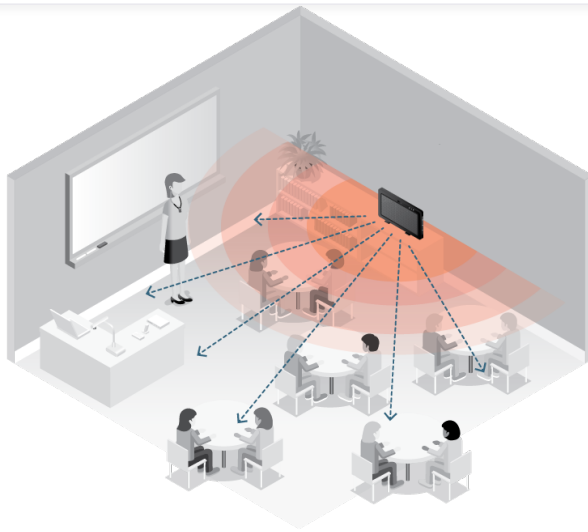
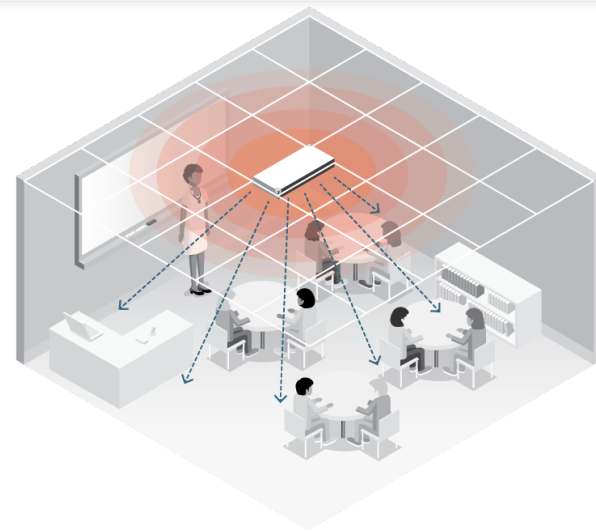


Table-top systems

Lightweight, portable,
no installation



Wireless ceiling systems

Easy-to-install, full-range audio
for media-rich classrooms

Meeting New Guidelines and Recommendations

- Modify classrooms and all learning spaces
 - Stagger schedules
 - Block schedules
 - Static Groups
- Social Distancing
- Remote Learning
- Hybrid classroom
- Face covering

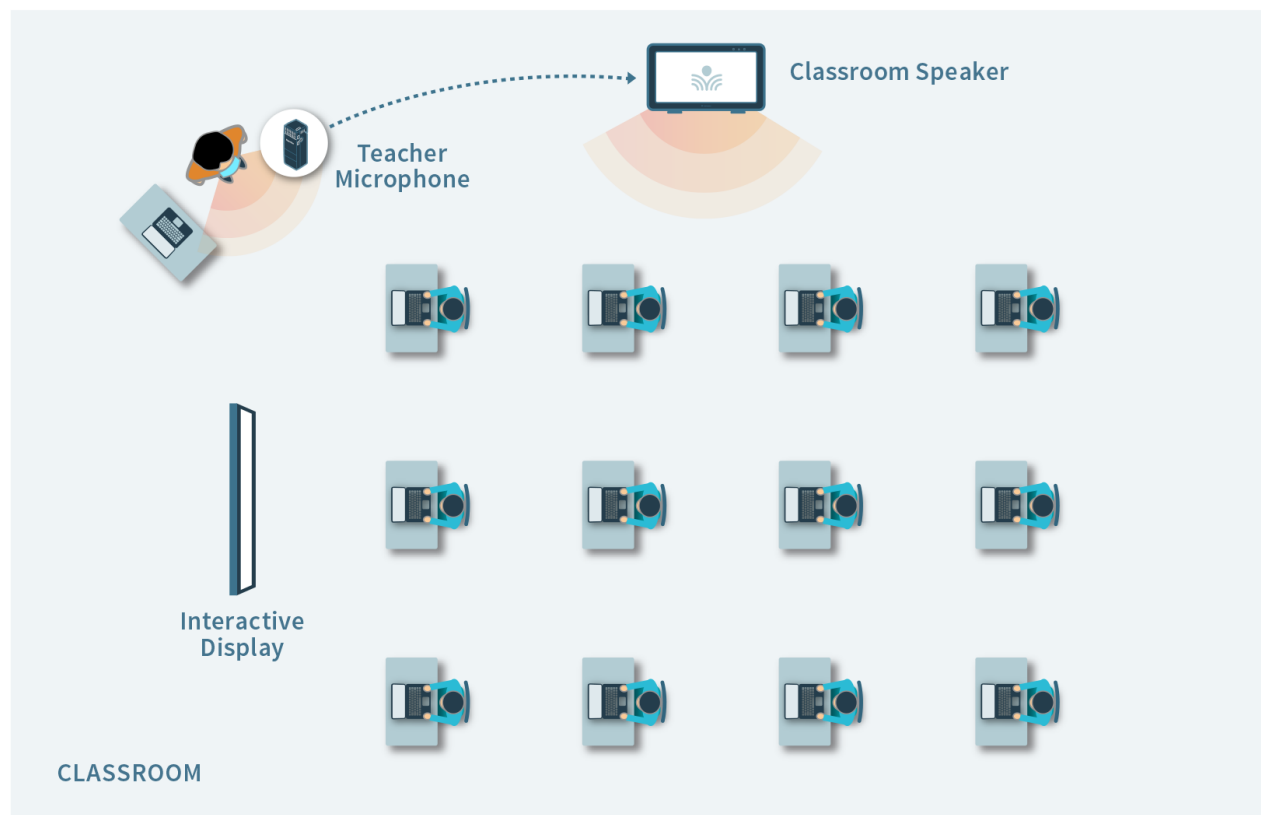
CLASSROOM WITH TEACHER AMPLIFICATION

Even with masks and social distancing, students will be able to clearly hear and understand their teacher with a classroom speaker system and teacher microphone.

IN THE CLASSROOM

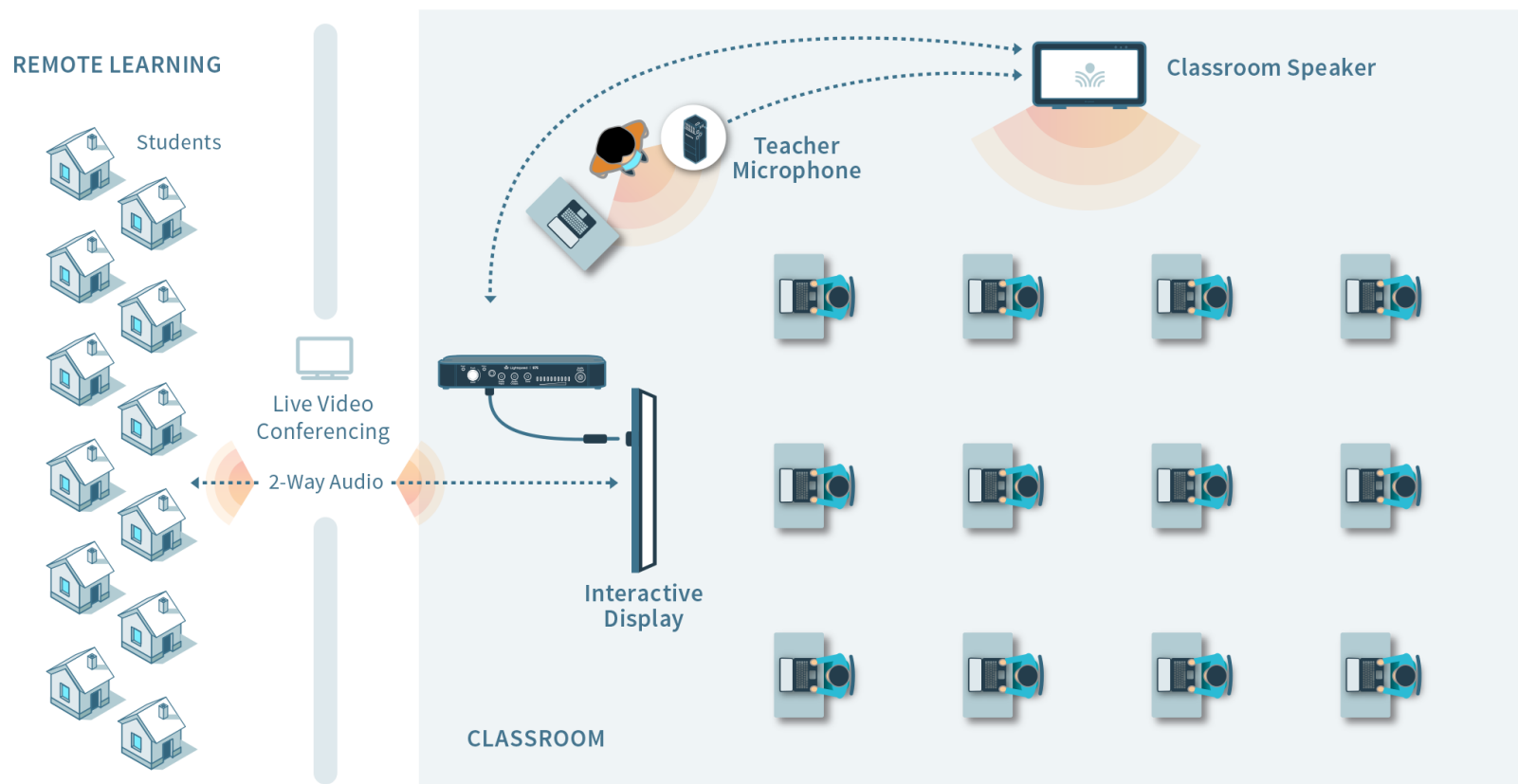


The lightweight, hands-free microphone reduces vocal strain by enabling the teacher to use their natural voice.



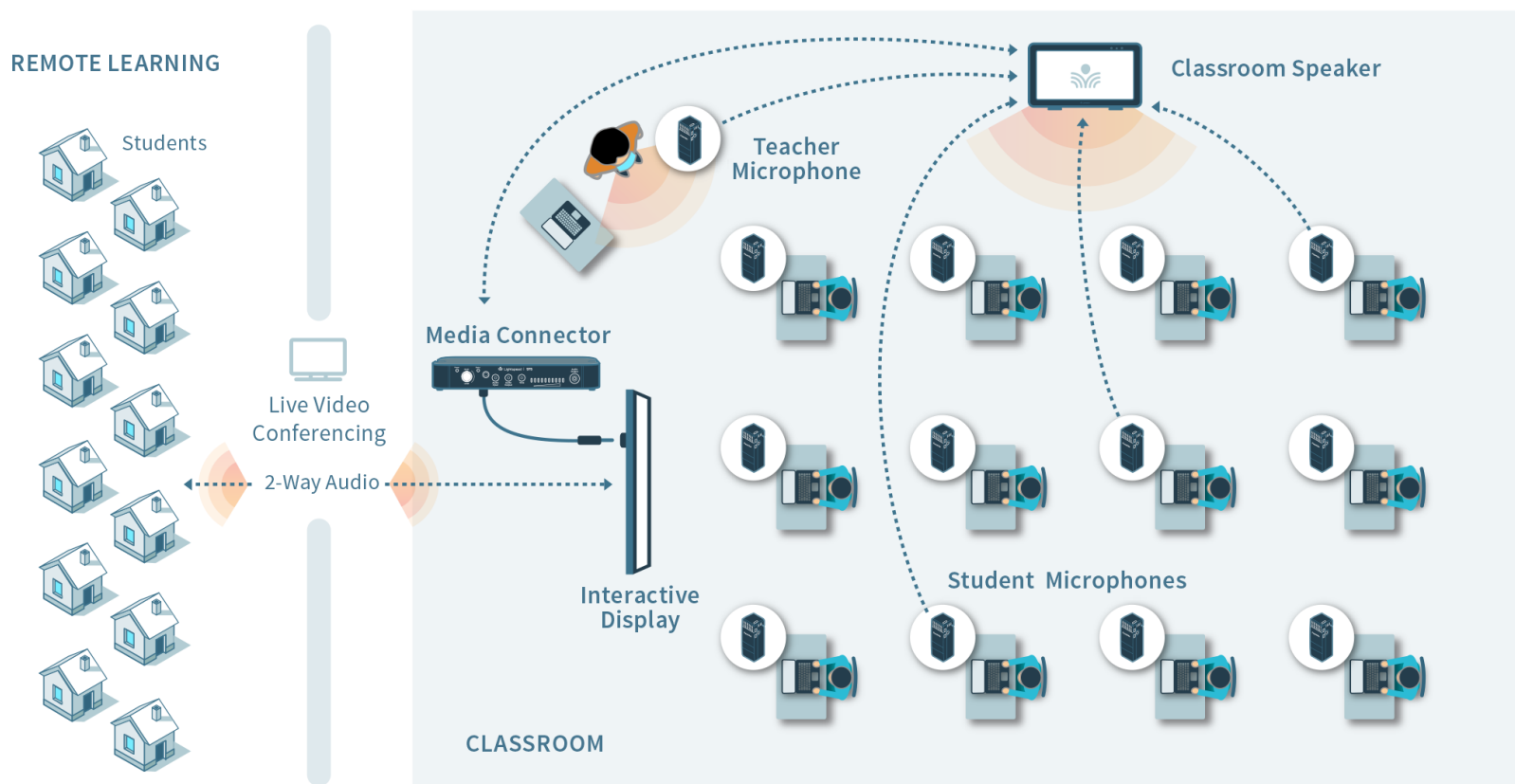
HYBRID OR SPLIT CLASSROOM WITH TEACHER AMPLIFICATION

Both in-room and remote students will hear the teacher clearly with a classroom speaker system, teacher microphone, and media connector. Remote students can be heard in the room through the classroom speaker.



HYBRID OR SPLIT CLASSROOM WITH TEACHER AND STUDENT AMPLIFICATION

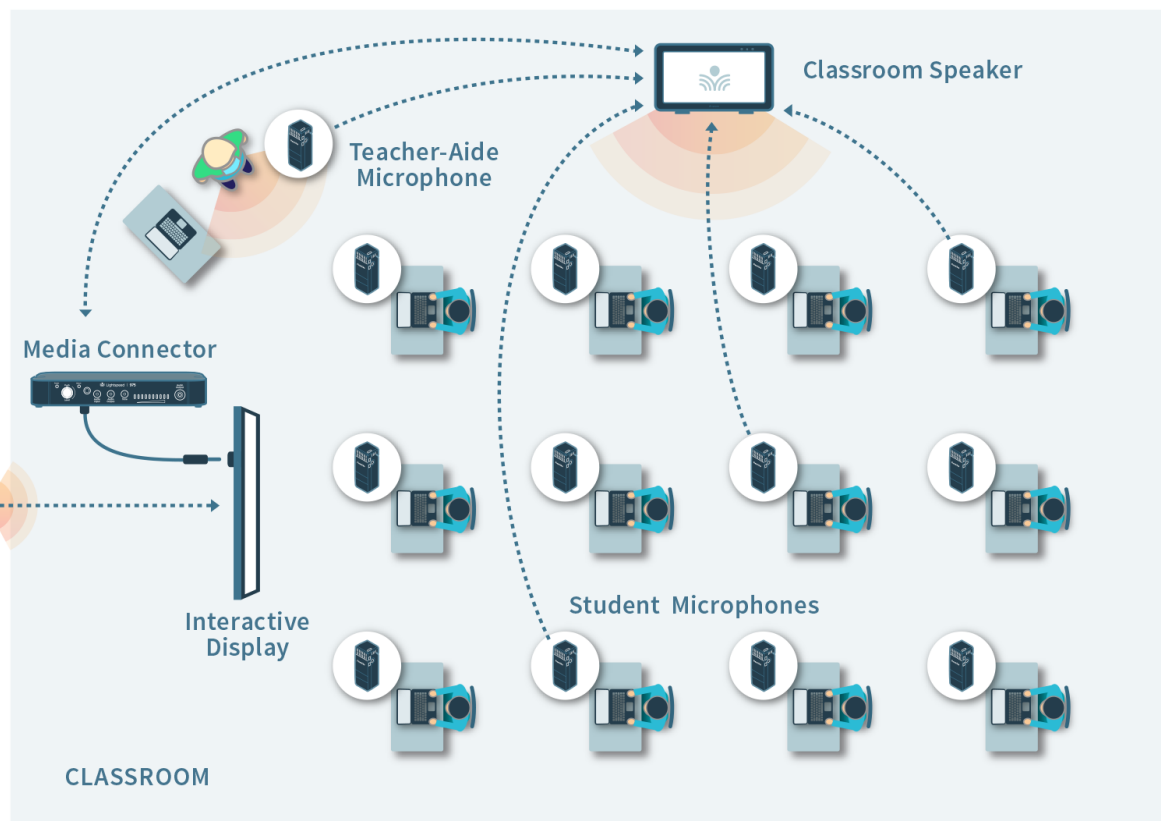
Keep students engaged with their teachers and peers with a classroom speaker system, teacher microphone, student microphones, and a media connector. Student or teacher managed options available for student amplification.



REMOTE TEACHER WITH STUDENT AMPLIFICATION IN THE CLASSROOM

When the teacher is remote, in-room students are able to understand and engage with their teacher with a classroom speaker system, teacher-aid microphone, student microphones, and a media connector.

REMOTE TEACHING & REMOTE LEARNING





We are here to help.

Lightspeed offers instructional audio solutions for the whole classroom, distance learning applications, and small groups.

Contact us to discuss which solution best meets your learning space needs.

[Lightspeed-tek.com](https://lightspeed-tek.com)

800-732-8999



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