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Enhancing Access: Classroom Acoustics & Assistive Listening Technology for DHH Students, in partnership with RIT/National Technical Institute for the Deaf

Presenter: Carly Alicea, AuD, PhD, CCC-A

All right, well, thank you everyone for joining us today for our webinar on enhancing access, classroom acoustics and assistive listening technology for deaf and hard of hearing students. In partnership with the Rochester Institute of Technology and National Technical Institute for the Deaf, it is my pleasure to welcome Dr. Carly Alicea as our speaker today. Carly is a clinical audiologist at RIT NTI for the Deaf, where she provides comprehensive diagnostic and rehabilitative services to students, faculty, staff and their families. She also serves as a member of the Department's Committee on Continuing Education Planning and Teaching continuing education workshops for audiologists and speech language pathologists. If you'd like to learn more about our presenter, additional information and bios are on the course registration page.

With that welcome Carly. We're so happy to have you with us today. At this time, I will turn over the mic to you. Great. Thank you so much.

I'm very excited to be here today and talk with you about classroom acoustics. I apologize if my voice is a little bit raspy. I am getting over an illness, so if I have to take a couple extra breaks to cough or sip water, please forgive me. These are my speaker disclosures and here you can see the limitations and risks of today's course as well as the course learning outcomes. I want to start today by talking a little bit about who we are at NTID.

So the National Technical Institute for the Deaf, or NTID, is one of nine colleges of the Rochester Institute of Technology in Rochester, New York. NTID was established by an order of U.S. congress in 1965 to provide higher education opportunities for deaf and hard of hearing students. Students we have a very diverse student population at NTID in terms of learning, excuse me, listening technology use and communication modes. So you can see here that we have a mix of students who use hearing aids, cochlear implants, both hearing aids and cochlear implants, or no listening technology, as well as a diverse set of communication modes. So 38% of our students prefer to communicate with American

Sign Language, 25% prefer to communicate with spoken language, 30% prefer to communicate with a combination of spoken language and sign language, and 7% prefer some other form of communication.

So truly a diverse mix.

We have ASHA certified audiologists and speech language pathologists at NTID who provide on campus audiological and speech language services to members of the RIT and NTID community. Our primary mission is to serve and support the diverse communication needs and communication skill development for our deaf and hard of hearing college students, SLPs and audiologists who work at NTID are fluent in American Sign Language, and we prioritize matching each student and client's language and communication modalities. If you're interested in learning more about our department, our website is here at the bottom. We run full service audiology and speech language clinics on campus and you can read a sampling of the services that we provide here. We are excited to be partnering with Speech Pathology.com and Audiology Online to bring this course to to you today.

And if you are interested in learning more about ntid, there is a brochure with more information about us available as a handout for this course so that you can learn more. Let's dive in now into today's topic of classroom acoustics. So I want to set the stage by first talking about why does this matter? Why should we care about classroom acoustics? So it's very important for us to recognize and keep in mind that good classroom acoustics benefit all students and their teachers.

So when the acoustics in a classroom are ideal, students can learn better, teachers can teach better. It's better for teachers voices not to be needing to raise their voice in order to be loud enough for their students to hear them. We want to keep in mind when we're thinking about classroom acoustics that classrooms should be free of excessive noise and reverberation so that we can achieve positive educational outcomes and effective communication. So effective communication between teacher and student, effective communication between, you know, students in a class with one another. And mostly

we want to keep in mind that classroom listening environments should let children focus on thinking and learning and not on trying to listen.

So if students need to be focused on trying to figure out what is being said, they have less cognitive capacity available to focus on learning, remembering, retaining the information that's being being taught. So it really is important that we consider classroom acoustics, particularly when we consider students who are deaf and hard of hearing.

Now, classroom acoustics and considering classroom acoustics is important for deaf and hard of hearing students, no matter their age. But I want to take a moment to also discuss specifically some some of the differences between children and adults when we're thinking about listening in noise or listening in noisy situations. So typically hearing adults are mature and skillful listeners. They have lots of practice listening. And so typically hearing adults can rely on, you know, language that they have acquired as well as life experiences that they have had to help assist them with auditory closure and to help them understand speech in suboptimal conditions.

So even when adults with typical hearing are in a difficult acoustical environment or are in A classroom with poor acoustics, they have lots of tools and skills and experience that they can rely on to help them understand the message. Children and people with hearing loss are more adversely affected by noise and reverberation. So the auditory system is not fully developed until adolescence. And so that is part of the challenge. Children also have less of that life experience.

They're still learning language, and so they don't have all of the same advantages they that typically hearing adults do when they're listening in a noisy environment or in a poor acoustical environment. And so it's important to recognize that children perform more poorly than adults on complex listening tasks. And understanding speech in a noisy or a reverberant room is an example of a complex listening task that is going to be more challenging for a child than it will be for an adult with typical hearing.

So keeping that in mind, sort of layered on top of that, we also want to recognize that there are certain children and certain students who are going to be even more at risk in a noisy classroom than others. And so there are a number of different groups of students who are more at risk in a noisy classroom. And this would include young students, by which really I mean any student under the age of 15, students with hearing loss. And that is going to include all types and degrees of hearing loss. So students with conductive hearing loss, sensorineural hearing loss, mixed hearing loss, even students with minimal or mild hearing loss are at risk in a noisy classroom.

Students who have auditory processing disorder or auditory neuropathy, students who have an ear infection or students who have recurrent ear infections. Students with language disorders are at higher risk. Students with language based disabilities, developmental delays or disabilities, students with ADD or adhd, and students who are learning English, English language learners, all of these students are going to be at even an elevated risk compared to other children when it comes to learning in a noisy classroom.

So I want to take some time to talk about some specific factors that impact the acoustics in a classroom. And we're going to talk about each of these factors in a little bit more depth on the upcoming slides. But I want to consider the role of distance, directionality, reverberation, and noise. So let's start with distance. So when we think about the impact that distance has on acoustics in a classroom environment, we want to think about distance from the sound source.

And so in a classroom, that might be the teacher, that might be a video, an instructional video that the class is watching, that might be another student who is talking as part of a classroom discussion. And what we want to keep in mind with distance is the inverse square law. So this is something that was probably covered at some point in your education, back in undergrad or grad school, when you took a sound science course or a course that covered sound science. But as a review, the inverse square law

says that sound intensity, so volume of a sound, decreases with increased distance from the source.

So basically, the further we get from a sound, the quieter that sound gets.

And specifically, the inverse square law says that for every doubling of distance, sound pressure level decreases by about 6 decibels. So if we look at this graphic on this slide, we can see that the student in the purple sweatshirt, she is, let's say, one meter from the teacher. And so perhaps at her desk, the teacher's voice is 60 decibels. But you'll see by the time we move to the student in the green sweater, who is 4 meters away from the teacher, that teacher's voice has dropped to 48 decibels. Now, I do want to give the caveat with the inverse square law that, you know, this assumes some, like, perfect acoustical conditions, things like the sound source radiating sound in all directions evenly.

And it also assumes that we have, like, a free field where there are no obstructions or boundaries. So this is not going to apply perfectly in a classroom. But the fact that sound intensity decreases with increased distance from the source is the important point to understand the fact that this is very real, that that student who is sitting in the back row really is getting a significantly lower signal, significantly lower volume of the teacher's voice than the student who is seated directly in front of the teacher when they are speaking.

Directionality is somewhat, you know, obvious just right from the name. But I like this graphic for illustrating what I mean when I talk about directionality. In this picture, we have a teacher, she's writing something on the board. And so if we also imagine that this teacher is speaking, you can pretty obviously see that the challenge here is that this teacher's voice is not going in the direction of the students in the classroom. And so that is going to have an impact on the sound signal that the students are receiving on how easy it's going to be for students to hear and understand.

And although the focus of this webinar today is classroom acoustics, I do want to just make a side note that when we think about directionality, we can also think about the impact that this has on deaf and

hard of hearing students who are also going to be using speech reading or facial cues to help assist with speech understanding. So obviously, in this particular situation, if our deaf or hard of hearing student cannot see the teacher's face, cannot watch their face, miss those facial cues, not use speech reading, that's also going to have an impact on their speech understanding ability.

Next, I want to talk about reverberation. So reverberation is the persistence of sound in a space after it is produced. And what causes reverberation is sound reflecting on surfaces in an enclosed space. So you can see that in this image that we have our teacher, our teacher is talking, and some of the energy from the teacher's voice is going directly to the student. You can see the black arrow showing that.

But then we've also got all of those red arrows which are showing that some of the sound from the teacher's voice is going out and hitting the ceiling and reflecting, hitting the floor and reflecting, hitting the wall and reflecting. Now, some of these early reflections can actually provide benefit. So some of these early reflections of sound will arrive at the ear soon enough that they'll be able to be integrated with the direct signal of the teacher talking. And so that can actually enhance speech audibility. But some of the late, those late reflections can be detrimental.

So those late reflections create noise that can smear the important temporal information in the direct signal and that interferes with speech perception. So we do not want too much reverberation in a space, especially in a classroom space, or we start to run into, you know, poor sound quality that can impact students and how they hear and learn. So we measure reverberation in what is called reverberation time. You will see that abbreviated as RT60. Reverberation time is specifically the amount of time that it takes for a sound level to decay or to drop by 60 decibels after the onset.

And so in rooms that have longer reverberation times, which reverberation time is measured in seconds. So in rooms that have longer reverberation time, speech perception is going to be negatively impacted and learning may be affected. So this is an important consideration.

And finally, I want to talk about noise. So noise is any unwanted sound that interferes with what a listener wants or needs to hear. So in a classroom, noise can be external or it can be internal. So internal noise is going to be noise that's coming from something in that classroom learning space. External noise is going to be something that's coming from outside.

You can see in my little graphic here lots of examples of internal and external noise. So internal noise, we might have students whispering chairs being pulled out and pushed in, projectors whirring, students coughing, External noise sources might be things like kids who have recess playing on the playground, a thunderstorm, lockers slamming in the hallway, you know, the classroom next door walking down the hallway, construction on the road outside the school, or construction on a nearby lot. And so when we think about noise, one measurement to keep in mind as important is what we call the signal to noise ratio. So basically, how loud is the thing that we want a student to be listening to or to be able to hear relative to the background noise level in the classroom? And so a good goal for signal to noise ratio is, is plus 15 decibels.

So we ideally want. Excuse me, we ideally want the, for example, the teacher's voice to be at least 15 decibels louder than the background noise level in the room. But it's really important to note that we might need an even higher signal to noise ratio for those students who are especially at risk from poor classroom acoustics. So for our students with hearing loss, for students with auditory processing disorder, ENL learners, etc. All of those groups that are especially at risk, they may need even more than that 15dB signal to noise ratio.

So what are the impacts of poor classroom acoustics? You know, if we have poor classroom acoustics, there are a number of things that can result from that. Poor classroom acoustics can result in reduced speech intelligibility, you know, speech being more difficult to understand. Excuse me, it can. One moment, I have to cough again.

It can result in increased listening fatigue. This is an especially important consideration for our deaf and hard of hearing students who are already expending so much listening fatigue just on a regular daily basis, even when the classroom acoustics are good.

You know, ultimately, poor classroom acoustics can have impacts like reduced learning and poor behavior in the classroom.

And we want to keep in mind this really important point, that some students are going to be more at risk or more affected than others.

All right, so let's talk now about some standards for classroom acoustics as well as some strategies for better classroom acoustics. So what can we do to try and make the classroom acoustics better, particularly when we have for classroom acoustics in a learning space?

So first, thinking about classroom acoustic standards. So there are two published standards that exist for classroom acoustics. Both of these sets of standards come from ansi, which is the American National Standards Institute.

ANSI has one set of acoustical standards for permanent schools and then a second set of acoustical standards for classrooms that are relocatable classrooms. So that is why you will see two different sets of standards for classrooms.

It's important to note that these standards are voluntary. So that means that unless there is some local or state code that requires schools to follow these standards, there's not actually anyone forcing schools or classrooms to abide by these ANSI standards. But these standards do put out very specific recommendations for things like background noise levels in the classroom as well as reverberation

time. So specifically, these standards make recommendations like the background noise level in a classroom when the classroom is furnished, meaning it's got all of the furniture, technology, things that would typically be in the classroom when students were in there and learning. So when the classroom is furnished but unoccupied, the background noise level should not exceed 35 decibels.

They also make recommendations for reverberation time. Remember, that's RT60 reverberation time. So generally the recommendation is that RT60 or reverberation time should not exceed 0.6 seconds for average sized classrooms. It's really important to note that there's actually a separate recommendation for, for students with hearing loss, children with hearing loss, that reverberation time should not exceed 0.3 seconds.

And so, you know, really that's, you can see how much more of an impact long reverberation times or longer reverberation times can have on deaf and hard of hearing students.

So our classrooms generally quiet enough, right? That's the question. So we have just heard that the recommendation from NC is that an furnished but unoccupied classroom background noise level should not exceed 35 decibels. Do most classrooms meet this standard?

You know, many classrooms, probably even most classrooms are not meeting these ANSI recommended standards. So that's something really important to remember is that many, many students and many, many deaf and hard of hearing students are learning in classrooms where the background noise level is higher than that recommendation, where the reverberation times are longer than that recommendation. And so what are things that we can do about this to try to make classroom acoustics better and learning more effective and easier for our deaf and hard of hearing students?

Some potential responses to this are making physical modifications to the classroom and to the learning space using assistive listening technology or sound field amplification systems, aural

habilitation or rehabilitation and training, and education and advocacy. So not all of these are going to be covered in today's webinar. Really in today's webinar we're going to focus on the first three things in this list.

There is a webinar coming in the Spring from RIT NTID on the topic of oral habilitation and rehabilitation and training. So if that's something that you're interested in, keep an eye out on that. And we will touch a little bit today on education and advocacy, but mostly in the next section, we're going to focus on the first three things on this list.

So let's first talk about physical modifications. And I want to preface this by saying that you'll notice that some of these physical modifications that we discuss today are things that a classroom teacher could do on their own or things that you as a speech language pathologist or audiologist could recommend to a classroom teacher that could be easily implemented in their classroom setting. Other things on these lists are much bigger, more expensive projects, and decisions about those would be made, you know, at a higher administrative level. And so when we're thinking about that, you know, that's a really important place where we can think about our role when it comes to education and advocacy, you know, making sure that we are educating the people in our schools about the importance of good classroom acoustics, about the impacts of poor classroom acoustics on all students, but especially those students who are more at risk from poor classroom acoustics. So something to keep in mind as we go through some of these physical modifications.

So thinking first about what are some physical modifications that can be made to the ceilings in a classroom learning space? So if we have high ceilings, we can think about adding acoustic panels. You could think about adding a suspended ceiling of sound absorbing tiles to help with background noise and reverberation.

Could consider changes or modifications like replacing. Replacing existing ceiling tiles with better acoustical tiles that could make a big difference. This last one really is going to be dependent on rules and fire codes in the building and in the area, but basically thinking about suspending things from the ceiling that will help absorb sound. So things like banners or flags, hanging student artwork from the ceiling, you know, any kind of decor that will help absorb some of the sound in the room in order to reduce noise and reverberation. We can also think about physical modifications that can be made to the floor.

Examples of modifications that we can make to the floor would be things like installing carpeting, or if we can't install carpeting, using area rugs throughout the room, and putting pads beneath carpeting or area rugs will also make a difference. Again, introducing soft absorbent surfaces to help absorb that excess sound. Thinking about modifications to walls, windows and doors. Again, adding soft materials wherever we can. So adding soft materials to the walls like carpet, we or Acoustic tiles, covering the walls with bulletin boards that are cork or felt or flannel.

Adding curtains or adding acoustically treated blinds or shades. Installing double pane windows and making sure that doors are solid core and that doors seal tightly so that the classroom can be closed off from noise coming from outside the classroom during the day. And we can also think about physical modifications to the room that involve furniture. So thinking about staggering desks or chairs so that sound doesn't travel directly to hard surface, hard reflective surfaces like walls, chalkboards, windows, using felt or rubber caps or tennis balls on chair and table legs to help reduce the noise that furniture makes when it moves around the room. Thinking about rearranging furniture so that instruction occurs away from noise sources.

So thinking about arranging furniture in a classroom so that instruction can occur away from the doorway where there's a lot of hallway noise, or away from, like the really loud H vac vent, or away from

the bathroom in the corner of the classroom where students are flushing the toilet or washing their hands.

We can think about things like putting mobile bulletin boards or bookshelves at angles in the corners of the rooms, covering table surfaces with fabric, lining study carrels with acoustic tiles, or if we have equipment that is noisy, installing rubber pads underneath that equipment to help reduce the noise in those areas. So there are a variety of different physical modifications that can be made to help improve classroom acoustics. And again, some of those are things that can be easily implemented by teachers, right? Like most teachers can, you know, do something like covering table surfaces with fabric, you know, without needing, you know, permission, depending on the, the rules in that school. Other things like installing double pane windows are obviously going to be decisions that are made on a much higher level.

But we can play a really important role in educating administrators, school board, you know, all of the other decision makers about the importance of classroom acoustics and the importance of addressing classroom acoustics in order to help students learn the best that they can.

So let's move now onto talking about assistive listening technology and the role that assistive listening technology has in helping deaf and hard of hearing students learn effectively in the classroom. So a couple of things to keep in mind before we jump into this conversation about assistive listening technology.

One important point is that assistive listening technology must be customized for each student. We need to customize a student's assistive listening technology for that specific student's needs and also for the classroom context. And so, really, in order to be able to do this effectively, we need to work collaboratively. So there needs to be collaboration between audiologists and teachers, SLPs and the students themselves in order to make an effective assistive listening technology plan for a student that

meets their needs across all of the listening environments that they will encounter through the day. We want to keep in mind that deaf and hard of hearing students need to be trained and empowered to use their assistive listening technology as a tool.

So that's an important role of ours, is not only to help select assistive listening technology that's going to be appropriate, but also to make sure that our students know how to use that technology and feel empowered to use that technology throughout their day. And we also have an important role in encouraging and training the student and the teachers and anyone else who they're interacting with throughout the school day on how to perform regular equipment checks to make sure that the assistive listening technology is functioning the way that it should, as well as listening environment evaluations.

So we are going to have a little bit of interaction here. I want us all to think about the variety of different listening situations that students might be in throughout the day. So you can see some examples in the graphic on this slide. But if you are joining me live today, I want you to share in the chat other listening situations that you can think of. I want you to think about students like across all levels.

So preschool, all the way up to college. What kind of listening situations are students in? If you're watching this as a recording, you can go ahead and pause it here and just take a few minutes to think about as many different listening situations as you can. So go ahead and throw those in the chat. I will read some of them out as I see them come in.

I'll give everyone a few minutes. I also just want to remind everyone that if you have questions that you want me to address at the end, you're going to want to put those in the Q and A, not in the chat. Your questions will get lost in the chat. So listening situations in the chat, Questions in the Q and A. I'll give everyone a minute or two.

All right, I'm just going to start off reading some of the things that I see. Lunchtime, the cafeteria, teletherapy, the gym, specials, classes at a high school dance. I like that one.

Listening in an active preschool setting, which may include outside time assemblies. It's an important one. Working on group projects, listening in the library, music classes, band, orchestra building announcements.

Lots of great different situations in here. Listening to announcements at dismissal. All real, really important. So there is such a huge variety of listening situations that our students are in throughout the day. And you know, because of this, because every student is different, because every student is in different listening situations throughout their day.

There is no. It's really important that we keep in mind that there is no one size fits all solution to assistive listening technology in the classroom or in the school. So I cannot tell you what one type of assistive listening technology is going to be best for your deaf and hard of hearing student because they're just simply is not such a thing as the best for, you know, the best in general. We have to consider what is the best for that student, what is the best for that student in different situations. So the best for one student might be a couple different kinds of assistive listening technology depending on, you know, that they rotate between, depending on where they are in their school day and what they are listening to.

But let's talk about some of the different types of assistive listing technology options that are out there and available to students.

So this is really going to be a brief overview of these types of technology. I would love to dive in deeper, but I only have an hour with you today. So we're going to have to just focus on the, the basics of each of these different types of technology.

First, I want to talk about FM or DM systems. So at this point in time, what most schools are using are DM systems. You know, these types of systems used to be called FM systems. And so FM system is sometimes still the terminology that's used in the school setting to talk about them. But at this point in time, you know, these systems are using a digitally modulated signal rather than a frequency modulated signal.

So a DM system is the more appropriate name. These are systems like Phonak's Roger system or Oticon's Edumike system. In a DM system, a teacher wears a microphone, often on a lanyard around their neck and the signal is sent wirelessly to a student's hearing aids or cochlear implant or a receiver that is attached to or installed in the student's personal listening technology.

Another type of assistive listening technology is a sound field amplification system. So this would be something like Phonak Roger Digimaster system or a lightspeed Redcat system. In this type of system again, the teacher wears a microphone, but the signal is then sent wirelessly to a speaker or a speaker system in the classroom that evenly distributes the teacher's voice throughout the room for all students. So with a sound field system, it's not just a student who is deaf. Or hard of hearing who is receiving that signal or benefiting from that signal.

It is every student sitting in the room because the teacher's voice is coming out of a speaker or a system of speakers that is set up in the classroom. Another type of listening technology is what we call a pass around microphone. So an example of this would be Phonak's Roger pass around mic. This is a handheld microphone. So rather than something that's going to be worn on a lanyard or clipped on, you know, it looks like, you know, a microphone that a stand up comedian would hold as they do their show.

It's a handheld microphone that teachers or students can speak into. It can be passed around, hence the name a pass around microphone passed around from person to person and the signal is going to

be sent wirelessly to a receiver that again is either attached to or installed into a deaf or hard of hearing students hearing device. Or that signal could be sent to a speaker like with a sound field amplification system. Something like a pass around mic is great for classroom discussions where a deaf or hard of hearing student needs to be able to hear not just the teacher, but all of the other students in the class who are also participating in that discussion.

I like to point out that, you know, Bluetooth enabled hearing aids or Bluetooth enabled cochlear implant processors, which at this point in time, you know, many current hearing aids or CI processors are Bluetooth enabled. This is an example of a type of assistive listening technology that can be used in a classroom setting. You know, a student who has a Bluetooth enabled hearing aid or a Bluetooth enabled CI processor can connect directly to a laptop or a tablet that's being used in the school or in the classroom and stream audio directly to their personal listening device that way. And that is certainly something that you know, should and can be considered in a classroom setting when we're thinking about the best way to get students access to all of the different types of signals that they might need to listen to in the classroom environment.

So remote microphones are manufacturer specific microphones. So something like the Resound or Cochlear Mini Mic 2 Phonak Partner Mic, Oticon's ConnectClip. So hearing aid companies make these microphones to work specifically with their brand of hearing aids. So generally we can't cross these types of microphones across brands. So we can't use an Oticon microphone with a Phonak hearing aid or vice versa, but we can use an Oticon microphone with an Oticon hearing aid.

So they're manufacturer specific, specific to the company that made that microphone. And these microphones transmit the signal wirelessly to the students hearing aids or cochlear implants.

There is another type of microphone called a table microphone array. So this is something like the Roger Table Mic two. And so a table microphone array is going to be something that is set on a table.

For example, you know, a college student who has a study group that meets in the library, right? They can put this table microphone array down in the middle of the table and it will pick up multiple talkers.

So this is great for a group work situation, you know, great for a situation where a student needs to hear many different people who are all sitting around and having a conversation.

And then we can also think about media streaming accessories. So for example, something like the Roger Multimedia Hub. So a media streaming accessory is going to be a piece of assistive listening technology that connects to a range of different multimedia media devices. So things like computers, smart boards, TVs, tablets, and streams audio from those multimedia devices to the student's receiver. So thinking about a device like this is really important for situations like, you know, imagine a student who is sitting in a classroom with a smart board and the teacher is showing an educational video on the smart board.

And as they are showing that video, they are also talking about what is, you know, they're commenting on what's happening in the video. Maybe they're highlighting certain things that they want the students to pay attention to. A media streaming accessory can enable that student to hear have equal access to both the signal coming out of the smart board and their teacher's voice. So we have a media streaming accessory hooked up to the smart board and then we have the teacher wearing a DM system and the student can receive both of those signals simultaneously.

So how do we go about choosing classroom listening technology for a student? And again, there's not one single answer to what type of technology is going to be right because it is going to vary wildly depending on the student and the situations that they're in. And we want to keep in mind that a student might need more than one type of technology. So not only is it a one size fits all, it's also not a situation where one type of technology does it all. We might need more than one.

But important factors for us to consider as we are choosing classroom listening technology are things like, you know, what kind of device is the student using? Do they have a hearing aid? Do they have a cochlear implant? What brand is that device? What style is it?

Does it have a telecoil in it? You know, these are sort of the really practical questions that we need to know in order to figure out what kinds of listening technology can be used with this student's personal listening device. We want to consider what kind of listening situations is this student in throughout the day? Where do they need to be listening? What do they need to be listening to?

We want to think about flexibility and portability. So maybe we think that a sound field system would be a great solution for a particular student, but if that student is moving from one classroom to another throughout the day, a sound field system is not a very portable system. So are we going to have a sound field system, you know, multiple sound field systems, one in every space that that student is in, or do we need to think about picking some kind of assistive listening technology that is going to be more portable that the student can bring with them throughout the day? We have to think about the ease and the practicality of use. So can the student use the piece of technology that you have selected appropriately?

Can the teacher use it appropriately? You know, are there staff available in the building who are able to support the use of that device, troubleshoot that device if something goes wrong? You know, who do you have who can be called in to help with that? So we do need to think about the usability of the device. We need to consider, does the student have other needs or disabilities that may cause us to choose one type of assistive listening technology over another?

And, you know, I have this last, but not because it's least important. I actually have it last because I think it's one of the most important factors to consider. So I really wanted to be able to emphasize it. It's really important to consider a student's preferences and a student's willingness to use the piece of

assistive listening technology that you are considering or that you have selected. You know, students are the ones who are using this technology.

And so, you know, we really need to work collaboratively with them to find a piece of technology that's going to work for them, but also to find a piece of technology that they want to use, that they are willing to use, that they feel comfortable using. Particularly as students get older, once they get to the middle school, high school level, sometimes even upper elementary school, sometimes deaf and hard of hearing students feel that using assistive listening technology becomes a stigmatizing thing. They don't want to use something that sets them apart from their peers. They don't want to have to walk up to the front of the classroom every day and hand off a microphone to the teacher in front of all of their classmates. And so it's really important that we consider those factors and that we work creatively and collaboratively with students to find something that is going to work for them.

You know, we really need to keep the student centered in our discussion, and we need to involve the student to a degree that is appropriate, you know, based on their age and their grade level, to find something that is going to work for them.

All right, before we dig into a case study, I also want to take a moment to. To talk about this idea of strategic seating. So you may have heard of preferential seating. So maybe you've seen that in a student's iep, or maybe you've made that recommendation for a student. You know, usually when we think of preferential, seating, we think of that meaning like, oh, the student needs to be in the front row.

The student needs to be right near where the teacher talks. And so in the last couple of years, I had a TOD mentioned to me this idea. A tod, a teacher of the deaf mention to me that she had recently been in an IEP meeting where what they discussed adding to a student's IEP was not preferential seating, but strategic seating. And so I absolutely love this idea of strategic seating, because strategic seating replaces preferential seating with the acknowledgment that teaching and learning are dynamic. The

teacher is not always going to be standing in the same spot at the front of the classroom.

It acknowledges that the front row is not always best because maybe the front row is not where the teacher is. Maybe even if the teacher is in the front, if the student is sitting in the front row, they don't have good access to hear the peers behind them. You know, for lots of different reasons, maybe the front row isn't always the answer.

This idea of strategic seating acknowledges that the best spot for a student might look different across different parts of the day. Different settings, different teachers, different classrooms. You know, the best spot for a student to sit when they're in math class might look different than the best spot for them to sit when they're in English class later in the day. And it also acknowledges that different technology may be needed in different seating locations. And I also love that with this idea of strategic seating.

It also ties in this really important point, that it is an important responsibility of ours as audiologists and SLPs to support students in learning to identify their own strategic seating and in determining what type of technology is best suited for the situation. So if we move away from this idea of preferential seating, thinking about just one spot that we think of as the best spot in the room, and towards this idea of strategic seating. We can also think about working through that with students to help let them learn how to navigate that on their own, because that's such an important skill that deaf and hard of hearing students are going to need throughout their life once they get to college, once they're in the workplace, they need to understand how to situate themselves in a space where they can hear the best. All right, so with our last few minutes, I want to go over a quick little case study. And so this case study is actually based on my daughter.

This is not her real name and this is not her real picture. I made this picture with ChatGPT, but it looks a little bit like my daughter. And so I based this case study on her experience last school year in second grade because I felt like it was a really good example of some of the complexities when it comes to

classroom acoustics in a real life application. So let's consider Freda. Frida is 8 years old.

Frida has a bilateral moderately to severe conductive hearing loss and she wears binaural ossia devices. So those are implanted, an implanted bone conduction hearing device. And Frida also has a visual impairment. And so she sees best if she's looking straight on or to the left. And so that's another consideration in addition to her hearing loss.

When we're thinking about, you know, learning in a classroom and where is the most strategic place for her to sit, we have to keep in mind not only hearing needs, but also vision related needs.

So Frida was in a second grade integrated co taught classroom. So a classroom where students with disabilities and IEPs are taught, you know, alongside peers who do not have IEPs or disabilities. So she was in an ICT integrated co taught classroom at a suburban public school, was a large class, 23 students, two teachers. So one special education teacher and one general education teacher in the classroom all day and one classroom aid and then numerous students in the class receiving related services. So additional teachers and therapists are in the room throughout the day.

So, you know, at any point during the day there could be, you know, more than more than 30 people in the classroom. Adds a lot of background noise. Frida gets push in services from a teacher of the deaf and a teacher of the visually impaired. So those teachers are coming into the classroom to support her as well as pull out one on one services from an SLP and small group reading Support. Then she also attends one to two specials classes per day.

And here is a little schematic of what her classroom looks like. So we've got a bathroom in the corner of the classroom, a sink. You know, all the students are here, seated here, cubbies, hallway door. So I'll give you just a minute to look at this before we move on to the next slide, which has some questions that I want you to consider and type into the chat.

All right, and this star is where Frida was seated at the beginning of the school year. So take a look at that and then we'll move on to the questions.

All right, so we've only got a few minutes, but go ahead and type in the chat, or if you are watching this as a recording, pause and consider these questions, answers to any of these questions that you want to tackle. So what are some of the potential challenges to listening and learning for Frida in her classroom? What are some modifications to her classroom that you can think of to try and reduce these challenges? What kinds of assistive listening technologies can you think of that Frida might benefit from in the classroom? What might strategic seating look like for Frida?

All of these are things that we want to consider. We won't be able to do a deep dive into any of them with the time that we've got left. But go ahead and throw your thoughts into the chat, and I'll read some of them off as they come in.

Okay. Several people pointing out that recess happens right outside the classroom.

That in the seat that she was originally put in, there's a window and outside noise directly behind her. Looks like she was a pretty far distance from the classroom. Lots of distractions pointing out noise.

Someone says there's so many different zones that the students go into. Maybe a DM system would help.

Multiple recommendations to consider the DM or FM system.

Great. Lots of different thoughts.

So I hope that everyone will consider to think about these questions as we wrap up the course. I want to do just a couple conclusions to wrap up everything that we've talked about today. So distance, directionality, reverberation, and noise. All of these are factors that influence classroom acoustics and can make listening and learning difficult for deaf and hard of hearing students. There are physical modifications to a classroom environment that we can make to help ameliorate some of these challenges.

There's also a variety of assistive listening technologies that can help, but there's no one size fits all solution. And most importantly, students should be supported and empowered to understand their listening needs in the classroom and identify and utilize tools and strategies to manage those needs. All right, before we end today, I am going to put this slide up quickly. This is also in your handouts. A secondary mission of RIT and NTID is preparing professionals to work with the deaf and hard of hearing population.

And so we would really appreciate if you would take some time to complete this five question survey which helps us to monitor our impact and bring you the content that you want and need. You can scan this QR code to take the survey right now on your screen. This link is not clickable, but if you go to the handouts for this question course the link is clickable and so you can access the survey that way as well. It'll take you just a few minutes, but we would really appreciate that if you can take some time to complete the survey for us and let us know what other content you're looking for and what you learned from the content in this course. All right, so thank you all very much.

I think think I can take maybe one or two questions. I'm going to pull up the Q and A.

Okay, so this is a good question. Do you know of any states that require or strongly recommend ideal listening settings recommended by ANSI for classrooms? I do not and I actually tried to look into this to see if I could find any and I didn't have a lot of good luck finding the answer to that. So doesn't mean

that there aren't states that require schools to follow those anti standards for the classroom, but I think unfortunately it's not easy to track down those states if they do exist.

All right, I think I am at the end of our time today, so I'm going to go to our last slide. But thank you all so much for joining today for your contributions in the chat and I hope that you all have a great rest of your day. All right, wonderful. Excellent discussion questions and thank you so much parley for sharing your experiences and your valuable insights with us today. And then we do have the references for download on our course page to help expand on today's content.

If you do have any follow up questions, let us know. You can always reach out to us@customerexperiencecontinued.com and then if we could just go to. Oh we're already there at the last slide. There. Perfect.

Just a couple of reminders before we wrap up. The post exam will be available on your account within the next 10 to 15 minutes and then you can access it by logging into your account, going to pending courses and selecting take exam to receive course credit you'll take, you'll need to score 80% or higher on the exam. And just remember, you have seven days to complete the exam. Please also note the helpful quiz hints to help you guide in passing the post exam successfully. We do value your feedback which helps us improve our courses and bring you topics of interest in the future.

And again, if you do have any questions or need assistance, please reach out to customerexperiencecontinued.com we hope to see you guys again soon on Speech Pathology. Thanks everyone for attending. Please take care of.