Online Session 1

Aural Hab: Child

Karen L. Anderson, PhD
Supporting Success for Children with Hearing Loss

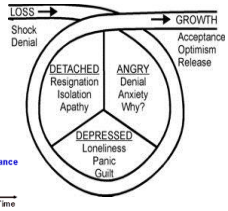
This Week's Learning Objectives
You will be able to …

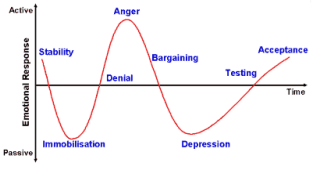
1. Describe key elements of working effectively with families (Parent and Professional Partnership)
2. Describe formant relationships of various speech sounds
3. Describe a child's hearing loss in terms of audibility for classroom speech at a distance and during typical instruction
4. Be able to report recommended criteria for childhood hearing screening

Professional & Parent Partnerships

Kris English Presentation:

- Feelings of loss are not a cycle, more like a roller coaster





Denial has a purpose

- **Provides time to gather inner strength**
- **Provides time to gather information**
- **Provides time for "readiness"**
- **Is a legitimate coping strategy**

Not just a river in Egypt….

What babies listen for:

- Babies recognize mom's voice (2 hours old)
- Babies choose listening to mom's voice more than unfamiliar women's voices (1 day old)
- Babies are more interested in mom's **I**nfant-**D**irected **S**peech than **A**dult-**D**irected **S**peech
- Anybody's IDS is more interesting than ADS
- Babies can perceive differences in timing, pitch, intensity, vocal quality
- Fernald (1985): Infants are "biologically predisposed to respond to human voice"

HEARING AS BONDING

It means 1) becoming calm, attentive 2) falling in love with family 3) becoming a 2-way communicator

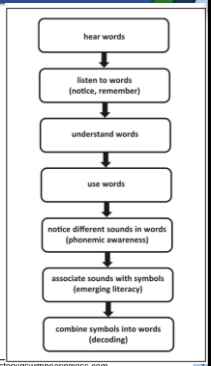
Babies & Listening

- **What Babies Listen For:**
  - "The love in our voice" – mother, ISD, prosody
- **What it Means to Them:**
  - What am I learning AND how do I feel?
- **How to Make Sure They Hear It:**
  - The ELF to find out what baby can hear
  - "**Mindful listening**" for "**auditory imprinting**

Tie early listening to reading

Our Challenge

- To help families value hearing, even as rest of world takes it for granted
- To use devices because hearing MATTERS
  - Matters to family, and then to child



Make It Yours

- Your next patient is a parent with a 6-week-old baby. You diagnosed a moderate hearing loss last week and they are back for further discussion and a hearing aid evaluation.
  - Mom is there because she knows she should follow up but she wants this all to go away.
  - How will you help her understand the hearing loss and what it means to bonding with her baby?
  - What tools/strategies could you use to make the case for hearing aids NOW?
  - What can you share with her that she can bring home to her husband and extended family so she can explain the hearing loss to them? Focus on key points.

Model of Child Aural Habilitation

Assessment

Define the impact of the hearing loss on life function
Under what situations is the child's ability to function impaired?
When/how will participation be restricted?
Talk about abilities not dB

Personal Factors – Skills
- Language use/communication
- Socialization skills
- Psychosocial/self-concept
- Additional Learning Challenges

Environmental Factors
- Speech perception under varying conditions
- Ability to attend / fatigue
- Speechreading benefit
- Accommodations currently in various environments

Get the Data

Interpretation of the Data

- **Need to 'make the audiogram come alive'**
- **Limitation – depicts only thresholds in an unrealistic listening environment**
- **Strength – 'apples to apples' – every child with hearing loss has an audiogram**
- **Challenges**
  1) Hearing loss is invisible
  2) If a child responds to any part of the something said, it is assumed he heard all of what was said
  3) Ability to understand well in a quiet setting is assumed to apply to all settings

Consonants	Formant 1	Formant 2	Formant 3	Formant 4
r (err)	600-800	1000-1500	1800-2400	
l (let)	250-450		2000-3000	
sh (shot)			1500-2000	4500-5500
ng (wing)	250-450	1000-1500	2000-3000	
ch (chat)			1500-2000	4000-5000
n (no)	250-350	1000-1500	2000-3000	
m (me)	250-350	1000-1500	2500-3500	
th (that)	250-350			4500-6000
t (tap)			2500-3500	
h (hat)			1500-2000	
k (kit)			2000-2500	
j (jot)	200-300		2000-3000	
f (for)				4000-5000
g (get)	200-300		1500-2500	
s (sit)				5000-6000
z (zip)	200-300			4000-5000
v (vat)	200-300			3500-4500
p (pat)			1500-2000	
d (dot)	300-400		2500-3000	
b (bat)	300-400		2000-2500	
th (thin)				about 6000

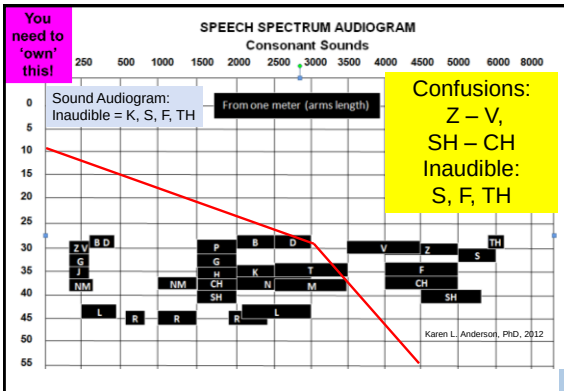
You need to 'own' this!

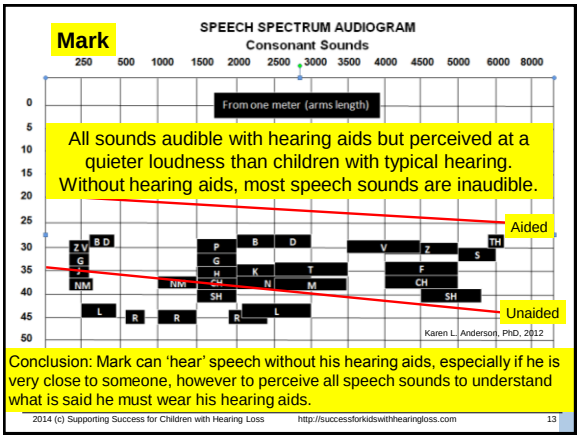
'sh' and 'ch' on the Sound Audiogram are shown at 1500 Hz

'z' and 'v' at 350 Hz

Based on information from Ross, M., Brackett, D., & Maxon, A. B. (1991). Assessment and management of mainstreamed hearing-impaired children: Principles and practices. Austin, TX: Pro-Ed. Interpreted by Karen L. Anderson, PhD, 2012

You need to 'own' this!

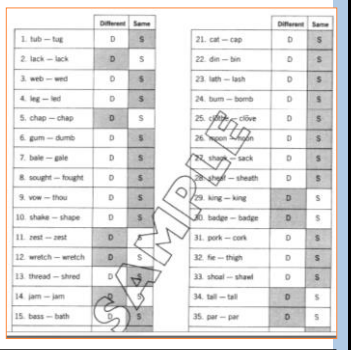




WHICH HiHz Sounds will be Confused?
Wepman's Auditory Discrimination Test (ADT)

- 40 word pairs
- Same/Different task
- Form A & Form B
- Normed on 2000 age 4-8 year olds
- Results in qualitative listening score (-2 to +2)
- Can compare skill level to age equivalent
- Can perform in quiet and noise
- Can look at errors diagnostically for initial, medial, final

Western Psych. Services



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Interpreting Abe's ADT results

- **Age equivalent for Abe (age 9 years)**
  - **Quiet (score of 26) = 5.0 – 7.5** age equivalence for average performance
  - **Noise (score of 20) = 4.0 – 4.5** age equivalence

1A- Qualitative Score	4.0-4.5	4.6-4.11	5.0-5.5	5.6-5.11	6.0-6.5	6.6-6.11	7.0-7.5	7.6-7.11	8.0-8.5	8.6-8.11
+2	28-30	29-30	28-30	29-30	29-30	30	30	30	30	30
+1	26-27	27-28	27	27-28	28	29	29	29	29	29
0 SCORE 26/30	20-25	23-26	22-26	23-26	24-27	26-28	26-28	27-28	27-28	28
-1	12-19	15-22	19-21	18-22	21-23	24-25	25	26	26	26-27
-2	10-11	10-14	10-18	10-17	10-20	10-23	10-24	10-25	10-25	10-25
2A- Qualitative Score	4.0-4.5	4.6-4.11	5.0-5.5	5.6-5.11	6.0-6.5	6.6-6.11	7.0-7.5	7.6-7.11	8.0-8.5	8.6-8.11
-2	28-30	29-30	28-30	29-30	29-30	30	30	30	30	30
-1	25-27	27-28	27	28	28	29	29	29	29	29
0 SCORE 20/30	15-24	21-26	22-26	23-27	24-27	26-28	27-28	27-28	27-28	28
-1	10-14	15-20	19-21	19-22	19-23	24-25	25-26	25-26	26	26-27
-2		10-14	10-18	10-18	10-18	10-23	10-24	10-24	10-25	10-25

Value for access to classroom communication & comparison to peers? Need for visual supports? FM? Other accommodations?

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AUDIBILITY ≠ SPEECH UNDERSTANDING

- **An analogy for *Audibility* –** *(Picture Puzzle)* Recognizing the subject of a picture puzzle depends on what pieces are missing and the complexity of the picture. **Opportunity**
- **An analogy for *Speech Perception* –** *(Text Puzzle)* Recognizing the content of a puzzle made out of written words depends on knowledge of vocabulary, syntax, the general topic and effort to figure out the missing pieces, especially when there is new vocabulary words and concepts. **Function**

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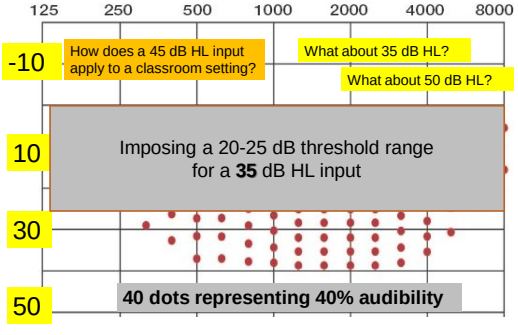
Adaptation to represent speech energy for a 35 dB HL input



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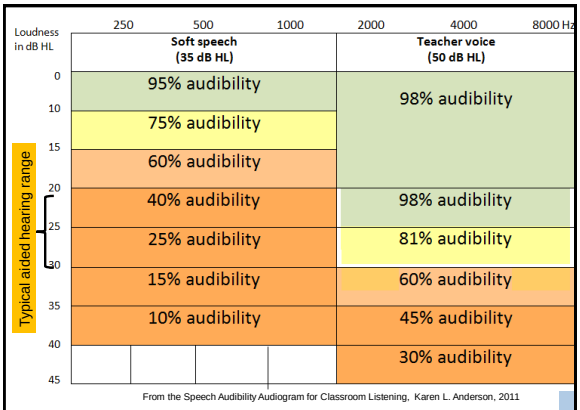

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Results in %	Age 3-5 M - F	Age 6-8 M - F	Age 9+ M - F
Quiet 50 dB	98-98	98-98	99-96
Quiet 35 dB	95-96	97-98	98-96
50 dB @ +5 S/N	93-94	94-95	97-93
50 dB @ 0 S/N	91-92	91-93	95-93
35 dB @ 0 S/N	90-92	91-90	91-90

You need to 'own' this!

- 1999 data from Bodkin, Madell, and Rosenfeld
- 126 typically hearing children ages 3-17 years
- Listening at 35 and 50 dB HL.
- Age appropriate open set single word lists (NU-C, PBK, W-22)
- Competing noise = 4-talker babble.

Also applies to sentences

The typical child performed at 90% or better = GOAL

What does the speech perception score really mean?
You need to interpret this rather than just reporting the %.

75%

Fran had a sore throat. She loved to jump on lily pads. Twilight and morning were the best time for her to eat. It made her happy to eat big juicy flies. But it hurt Fran to croak!

HL – Often poorer in noise and/or distance

85%

Fran had a sore throat. She loved to jump on lily pads. Twilight and morning were the best time for her to eat. It made her happy to eat big juicy flies. But it hurt Fran to croak!

90%

Fran had a sore throat. She loved to jump on lily pads. Twilight and morning were the best time for her to eat. It made her happy to eat big juicy flies. But it hurt Fran to croak!

Typical hearing

100%

Fran had a sore throat. She loved to jump on lily pads. Twilight and morning were the best time for her to eat. It made her happy to eat big juicy flies. But it hurt Fran to croak!

Make it Yours!

- **Word discrimination testing is very routine for audiologists, yet what it tells us about how well a person will be able to perceive speech is much more valuable than the audiogram.**
- One of your patients will be going to a new school to start 1st grade. He has a 35-65dB loss bilaterally and is a good hearing aid user. His WDS in quiet is 84% and in noise is 72%. What would you write in the report to the school that would help them understand this is a concern?

Relationship of Hearing Loss to Listening and Learning Needs

Child's Name:_____ Date:_____

26-40 dB HEARING LOSS

Possible Impact on the Understanding of Language and Speech	Possible Social Impact	Potential Educational Accommodations and Services
• Effect of a hearing loss of approximately 20 dB can be compared to ability to hear when index fingers are placed in ears. • A 26 – 40 dB hearing loss causes greater listening difficulties than a "plugged ear" loss. • Child can "hear" but misses fragments of speech leading to misunderstanding. • Degree of difficulty experienced in school will depend upon noise level in the classroom, distance from the teacher, and configuration of the hearing loss, even with hearing aids. • At 30 dB can miss 25-40% of the speech signal. • At 40 dB may miss 50% of class discussions, especially when voices are faint or speaker is not in line of vision. • Will miss unemphasized words and consonants, especially when a high frequency hearing loss is present. • Often experiences difficulty learning early reading skills such as letter/sound associations. • Child's ability to understand and succeed in the classroom will be substantially diminished by speaker distance and background noise, especially in the elementary grades.	• Barriers begin to build with negative impact on self-esteem as child is accused of "hearing when he she wants to," "daydreaming," or "not paying attention." • May believe he/she is less capable due to difficulties understanding in class. • Child begins to lose ability for selective listening, and has increasing difficulty suppressing background noise causing the learning environment to be more stressful. • Child is more fatigued due to effort needed to listen.	• Noise in typical class will impede child from full access to teacher instruction. • Will benefit from hearing aid(s) and use of a desk top or ear level FM system in the classroom. • Needs favorable acoustics, seating and lighting. • May need attention to auditory skills, speech, language development, speechreading and/or support in reading and self-esteem. • Amount of attention needed typically related to the degree of success of intervention prior to 6 months of age to prevent language and early learning delays. • Teacher inservice on impact of a 26 – 40 dB hearing loss on listening and learning to convey that it is often greater than expected.

All in one reference for report writing!

Degree of Hearing Loss	General Issues with this Degree of Hearing Loss	Audibility of Speech Sounds (puzzle pieces available for understanding) "Soft speech" 35 dB HL	"Conversational speech" 45 dB HL	"Teacher speech" 50 dB HL
20-25 dB	Impact of a 20 -25 dB hearing loss can be compared to ability to hear when index fingers are placed in ears. A 20 dB or greater hearing loss in the better ear can result in absent, inconsistent or distorted parts of speech, especially word endings (s, ed) and unemphasized sounds. Behavior may be confused for immaturity or inattention. May be unaware of subtle conversational cues which could cause child to be viewed as inappropriate or awkward.	40% Missing Sounds f, s, th, p, k, v, z, g, sh, ch	80% Missing Sounds f, s, th, p, k, v, z	95% Missing Sounds All sounds detected but not as loud as normal
25-30 dB	Child can "hear" but misses fragments of speech leading to misunderstanding. Degree of difficulty experienced in school will depend upon noise level in the classroom, distance from the teacher, and configuration of the hearing loss, even with hearing aids. Will miss unemphasized words and consonants, especially when a high frequency hearing loss is present. Often experiences difficulty learning early reading skills such as letter/sound associations. Barriers begin to build with negative impact on self-esteem as child is accused of "hearing when he wants to", "daydreaming" or "not paying attention." May believe he/she is less capable due to difficulties understanding in class.	25% Missing Sounds f, s, th, p, k, v, z, g, sh, ch, l, a, j, m, d, b	65% Missing Sounds f, s, th, p, k, v, z, g, sh, ch	81% Missing Sounds f, s, th, p, k,
30-35 dB		15% Missing Sounds f, s, th, p, k, v, z, g, sh, ch, l, a, j, m, d, b, ng, o,	45% Missing Sounds f, s, th, p, k, v, z, g, sh, ch, l, a, j, m, d, b	60% Missing Sounds f, s, th, p, k, v, z, g, sh, ch
35-40 dB	Child begins to lose the ability for selective listening, and has increasing difficulty suppressing background noise causing the learning environment to be more stressful. Child is more fatigued due to effort needed to listen. FM needed to access verbal instruction. Repeat key student discussion.	10% Perceived Sounds u, e, l, ng	30% Perceived Sounds i, m, d, b, ng, i, a	45% Perceived Sounds i, m, d, b, ng, i, a, sh, ch,
40-45 dB	Even with hearing aids, child can "hear" but may miss much of what is said if classroom is noisy or reverberant. Without early amplification the child is likely to have delayed or disordered syntax, limited vocabulary, imperfect speech production and flat voice quality. With personal hearing aids alone,	0% Perceived Sounds None	15% Perceived Sounds u, e, l, ng	30% Perceived Sounds i, m, d, b, ng, i, a
45-50 dB	High risk to effective learning in class using personal hearing aids alone; FM is necessary for access in class.	0%	0%	15%
55-60 dB+	Conversation is inaccessible without amplification.	0%	0%	0%

From: Making Sense of the Audiogram

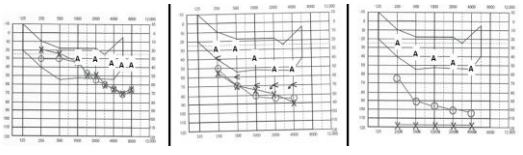
Make it Yours!
By the end of this course you will 'own' this!

You should be able to answer all of the questions

MAKING SENSE OF THE AUDIOGRAM

The audiograms below are for you to practice your interpretation skills. Consider how you would explain the impact of the hearing loss on development, listening, socialization and learning when speaking to a classroom teacher, administrator or family member.

- Bone conduction symbols are < > or [ ]. Air conduction right ear = O or Δ ; left = X or □ ; cochlear implant response = R_x or L_x **Questions to ask yourself:**
- Type of hearing loss: conductive, sensorineural, mixed? Would medical treatment potentially help improve this hearing loss (medicine, surgery)?
- Would this child benefit from a hearing aid? If A is on the audiogram that represents the hearing level when the hearing aid is used. Does it benefit him?
- How would this hearing loss impact development of language and social interaction skills (1) if identified/amplified at 2 months (2) if identified at age 3?
- Imagine the child is age 3 and has almost typical language. How would placement in a cross-categorical (children with many types of disabilities in one room) potentially affect learning? Consider typical language models, noise, and lack of DHH support being regularly available
- What would be the child's general ability to learn if no amplification was worn? (assume no sign language for the purposes of this exercise) What would you predict about speech intelligibility?
- How would this student's ability to access communication in the classroom be affected by typical noise/reverberation? Is an FM warranted? Why?



Childhood Hearing Screening

- Newborn hearing screening established in US
- Still at 35% loss to follow up for UNHS fails
- Focus is now more on screening for ages 6 months – preschool (who does this?)
- School hearing screening used to be very common, multiple grades
- Now often not done at all in schools or only for grade K (1 + 2)
- Part of special education eligibility but can often be addressed very minimally

Resource for Early Childhood Screening

https://successforkidswithhearingloss.com/resources-for-professionals/child-hearing-screening

AAA Childhood Hearing Screening Guidelines

- Released in 2011 – 78 pages **RESOURCE!**
- AAA endorses early detection of hearing loss in children using evidence-based hearing screening methods
- Hearing loss is the most common developmental disorder identifiable at birth and prevalence increases throughout school-age
- Under identification of HL has broad economic effects as well as impact on educational, cognitive, & social development
- Identifying new or emerging hearing loss in one or both ears followed by appropriate follow-up for referral and diagnosis/treatment are the first steps to minimizing these effects. **https://successforkidswithhearingloss.com/resources-for-professionals/child-hearing-screening**

Pure Tone Screening

1. Perform biological check on pure tone screening equipment prior to daily screening.
2. Screen populations age 3 (chronologically and developmentally) and older using pure tone screening.
3. Perform a pure tone sweep at 1000, 2000, 4000 Hz at 20 dB HL
4. Present a tone more than once but not more than 4 times if a child fails to respond.
5. Only screen in an acoustically appropriate screening environment.

Pure Tone Screening

6. Lack of response at any frequency in either ear constitutes a failure.
7. Rescreen immediately.
8. Use tympanometry in conjunction with pure tone screening in young child populations (i.e., preschool, kindergarten, grade 1).
9. Screen for high frequency hearing loss where efforts to provide education on hearing loss prevention exist.
10. Minimum grades to be screened: preschool, kindergarten, and grades 1, 3, 5 and either 7 or 9.

Tympanometry Screening

1. Calibrate tympanometry equipment daily.
2. Tympanometry should be used as a second-stage screening method following failure of pure tone or otoacoustic emissions screening.
3. Use defined tympanometry screening and referral criteria: a 250 daPa tympanometric width is the recommended criterion. If it is not possible to use tympanometric width then 0.2 mmhos static compliance can be used as the criterion. A final choice for failure criterion is negative pressure of >-200 daPa to -400 daPa however it is not appropriate for this criterion to stand alone to elicit referral.
4. Young child populations should be targeted for tympanometry screening.
5. Use results of pure tone or OAE and tympanometry rescreening to inform next steps.

Rescreening

Rescreening

1. Rescreen with tympanometry after a defined period: after failing the immediate pure tone rescreening and in 8-10 weeks for children failing pure tone or OAE screening and tympanometry.

2. Do not wait to perform a second stage screening on children who fail pure tone screening only

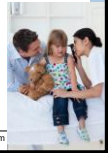
OAE Screening

1. Use only for preschool and school age children for whom pure tone screening is not developmentally appropriate (ability levels < 3 years).
2. Calibrate OAE equipment daily.
3. Maintain primary DPOAE levels at 65/55 dB SPL.
4. Select DPOAE or TEOAE cut-off values carefully.
5. Default settings may not be appropriate.
6. Screening programs using OAE technology must involve an experienced audiologist.
7. Children failing OAE should be screened with tympanometry.

Acoustic reflex testing, reflectometry and hearing screening using speech materials are not recommended

Realities

- **It is not enough to screen if there is no system of comprehensive follow up**
- In three school districts from which data were collected, information following referral was returned to the school in only 10-20% of cases.
- One Colorado school district documented that approximately 40% of the information returned following hearing screening was by families of preschool children, with return rates decreasing in number as children became older.
- It remains critical for the individual(s) coordinating the school hearing screening program to develop relationships with the local medical community, inform them of the screening protocols used and encourage their collaboration in returning results of medical or audiological evaluation following a hearing screening referral.



Resources

- **Tools for Training Hearing Screening Providers**
- Developed by Diana Emanuel of Towson University in conjunction with the Baltimore City School System
- Pure-Tone Hearing Screening in Schools: Revised (video)
- Common Mistakes (video)
- Commonly Asked Questions (video)
- Complete Notes for Pure-Tone Hearing Screening in Schools: Revised Video
- Notes on screening procedure only
- Note on Common Mistakes Video
- Notes on Commonly asked Questions Video
- Sample test questions for all three videos (multiple choice format)
- Practical evaluation checklist
- Useful websites

Make it Yours!

Hearing loss is not being identified because early childhood and/or school hearing screening practices are not in place, or are not effective.

You are a new community audiologist. You want to truly serve the hearing needs of your community and also increase referrals.

- You know what hearing screening practices are recommended and why it is important
- How could you go about finding out about the current state of child hearing screening in your area?
- This is a *systems* issue and rarely a single person issue. What challenges might you face? What could you do to initiate systems changes?

Preview for Next Week

- **Legal rights of children with hearing loss**
  - Early childhood – birth to 3 years
  - School-age – 3 to 21
  - Continuum of Educational Placement Optio
  - Pertinent Audiology Services under SpEd Law
- **Expanded Core Curriculum for Children who are Deaf/Hard of Hearing**
- **Common Core Standards** (very briefly)
- **Transition to Preschool**
  - Special challenges for the audiologist