

Chapter 13 – Assistive Technology for Students who are Deaf or Hard of Hearing

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ASSISTIVE TECHNOLOGY FOR INDIVIDUALS WHO ARE DEAF OR HARD OF HEARING

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Individuals who are deaf or hard of hearing utilize a variety of assistive technologies that provide them with improved accessibility in numerous environments. Most devices either provide amplified sound or alternate ways to access information through vision and/or vibration. These technologies can be grouped into three general categories: hearing technology; alerting devices; and communication supports. Within each main category there may be subcategories based on different purposes or intended audiences when utilizing the technology. The overall goal of all of these devices is improved accessibility to information most people gain through their hearing. The following descriptions related to these tools are intended to provide the reader with a better understanding of their purpose and when and how they might be utilized. Depending on their needs in specific situations, deaf and hard of hearing individuals may require assistive technologies. At times these assistive technologies may be used simultaneously. Many devices developed for use by deaf or hard of hearing individuals may also be beneficial to others without hearing loss; however, this information would be beyond the scope of this chapter. The information provided is considered to be comprehensive for the purpose of assisting the reader with a general understanding of assistive technology typically utilized by deaf or hard of hearing individuals. Every device, manufacturer and resource, however, cannot be realistically listed, due to ever changing technology and websites.

The description of a person's hearing loss is often based on their level of hearing at different frequencies as measured by an audiologist. Hearing loss levels are often broadly described as mild, moderate, severe and profound. Generalizations based on these single word descriptors often do not accurately predict an individual's skills across a variety of tasks such as speech, language, listening, communication mode, etc. The terminology "deaf" and "hard of hearing" used to describe individuals with hearing loss is based on a medical model and definition of hearing loss levels. How an individual views him/herself, however, can depend on self-identity and cultural values related to or separate from the status of their hearing. For example, a person who has a level of hearing that may be medically described as hard of hearing (a person diagnosed with a "moderate" or "severe" hearing loss) may actually identify him/herself as Deaf based on their preferred communication mode, cultural values, and self-identity. Regardless of definition, many deaf and hard of hearing people do not support the use of negative descriptors such as hearing loss, impairment, or disability. A basic description that attempts to address both medical and cultural perspectives of the differences between deaf and hard of hearing will be provided. It is not the purpose of this chapter to define these various points of view in-depth, but rather to describe assistive technology that supports deaf and hard of hearing individuals across a variety of environments. The WI Department of Public Instruction provides a general description of the differences between deaf and hard of hearing within their publication "Students who are Deaf or Hard of Hearing: Eligibility Criteria Guidelines (2003)" as follows:

Deaf: In the adult community, the term Deaf does not connote nor describe the degree of hearing impairment but rather an affiliation with the community of people who are deaf and use American Sign Language (ASL) to communicate. Deaf students may demonstrate the ability to speak or speech-read well in certain situations.

Deafness: This term indicates a hearing loss so severe that processing of linguistic information through hearing alone, with or without hearing aids, is severely limited. Students with cochlear implants are considered physically deaf even though they may function as hard of hearing. Deafness is not solely dependent on ability to speak or need to use sign language.

Hard of Hearing: This term describes a degree of hearing loss that allows the student to process acoustic information necessary for auditory-verbal communication, with the assistance of hearing aids or assistive listening devices (ALD) when needed. Yet the amount of hearing loss is not an accurate predictor of how one functions auditorally. The audiologic evaluation does not reliably predict the student's ability to hear with comprehension. Some hard of hearing students function very well with hearing aids and ALDs while some may require sign language to understand classroom instruction or conversation, especially in noisy situations.

WATI Assistive Technology Decision Making Guide

Area of Concern: Hearing

PROBLEM IDENTIFICATION

Student's Abilities/Difficulties	Environmental Considerations	Tasks
<p>What are the student's abilities & difficulties related to accessing auditory information?</p> <ul style="list-style-type: none"> • Benefit of assistive listening devices/personal amplification • Teacher/peers/announcements • Access to alarms/warnings • Telephone • Programs/Movies/DVDs • Person to Person • Group Activities • Note-taking 	<p>What environmental considerations impact the area of concern?</p> <ul style="list-style-type: none"> • Noise • Room Acoustics • Distance • Visual Access • Lighting • Available Technology 	<p>What task(s) do you want the student to do?</p> <p>The premise is always to access the same information as hearing students in all environments.</p> <p>Break it into measurable tasks:</p> <ul style="list-style-type: none"> • Complete and deliver report in social studies. • Identify key points in story (plot, characters) • Organize daily assignments
Sensory Considerations		Narrowing the Focus
<p>What sensory challenges does the student have that impacts this area of concern? (i.e., visual, auditory, tactile)</p>		<p>i.e. Identify specific task(s) for solution generation</p>
Solution Generation Tools & Strategies	Solution Selection Tools & Strategies	Implementation Plan
<p>Brainstorming only No decisions yet</p> <p>Review the area continuum</p>	<p>Use a feature match process to discuss and select ideas(s) from Solution Generation</p>	<p>AT Trials/Services Needed: Date Length Person responsible Formulate objectives/criteria to determine success of trial/AT</p>
		Follow-Up Plan
		<p>Who & When Set specific date/s now</p>

Important: It is intended that you use this as a guide. Each topic should be written in large print where everyone can see them, i.e. on a flip chart or board. Information should then be transferred to paper for distribution, file, and future reference.

Student Abilities and Difficulties

Each deaf or hard of hearing student performs differently in regards to how they utilize their residual hearing, are affected by different environments, and benefit from technology. As a team, discuss the student's abilities and difficulties related to accessing different types of information across different environments, tasks and situations. Some questions to consider may include:

- How does the student utilize their residual hearing?
- What type/s of hearing technology is the student using or has been used in the past?
- Do they use sign language and/or an interpreter?
- Can they access what the teacher says at the front of the room, while the teacher walks around, or with their back turned to the class while writing on the board?
- Can they access what their peers say during class discussions or group activities or while in challenging environments?
- Do they have access to fire/tornado alarms? Announcements?
- Do they have a way to contact home in an emergency? Community supports?
- Are movies/videos shown in class? Do the student, family and staff know how to access captioning?
- How do they communicate with others – family, peers, and community?
- Is the student able to take notes and watch the teacher/interpreter effectively?
- How do they access information during group activities – lectures, programs, or events?

Environmental Considerations

Happenings in the environment can have a significant impact on a deaf or hard of hearing student's ability to access information. One of the greatest challenges can be that extraneous factors are constantly changing from moment to moment, and from classroom to classroom; and most often are beyond the control of the student. A few areas to consider include:

Noise

What is the level of background noise from students, equipment like computers and overheads, and heating/cooling systems? Are there extraneous noises from neighboring classrooms, streets, playgrounds or hallways? Noise is present in every classroom to some extent and varies constantly. Background noise affects everyone's ability to hear and understand what is said. Noise has even greater impact on deaf and hard of hearing students because it tends to mask or cover over speech.

Room acoustics

What do the physical spaces the student spends time in look like? Surfaces (walls, windows, tile) and objects within every room interact to produce reverberation in response to sound. Reverberation refers to how much sound echoes in a given space and causes sound to become smeared or unclear. Every room has some amount of reverberation, but gymnasiums, cafeterias, auditoriums and music rooms tend to be more challenging listening environments. Smaller spaces and sound absorbing surfaces like carpet and acoustic ceiling tiles tend to have lower reverberations effects.

Distance

How far is the student seated from the teacher, interpreter, other students or alternate sound sources like televisions and announcements? Often deaf or hard of hearing students are seated in the front seat of a classroom, typically known as preferential seating. However, most teachers move about their classrooms while lecturing, so that the distance between them and the students varies. The farther a student is from the speaker or sound source, the softer the sound they receive. Sometimes, deaf or hard of hearing students can access spoken messages when they are close to the speaker, but they may not be able to do the same for peers located across the room.

Visual access

How well can the student see everything that is happening in different locations? Are there visual alarms? How is the student provided with access to announcements? Deaf or hard of hearing students often rely on their vision to provide information they may not have access to through their hearing. As previously mentioned, preferential seating typically involves the student sitting in the first seat. In reality, moving a student to a second or third seat provides them with more visual access to happenings within the class. They can see what some of the other students are doing without having to turn around. Arranging seats in a “U” shape or circle provides the greatest visual access. If a student relies on lip reading, they often need to physically turn in their seat to determine who is speaking and see what is being said. When a teacher turns to write on the board and continues to lecture, the deaf or hard of hearing student cannot continue to visually access what is being said. The same applies for note taking; every time a student looks to their paper, they lose visual contact with the speaker or interpreter. For many deaf or hard of hearing students, visual alarms are necessary for them to know when there is a fire or tornado drill. In addition, public address systems may have reduced sound quality that makes it difficult for deaf or hard of hearing students to access daily school updates. A written copy of announcements insures that deaf or hard of hearing students receive the same information as their peers.

Lighting

What type of lighting is available? Fluorescent lights are present in most school environments. These lights often emit additional background noise. Inadequate lighting or large banks of windows can be challenging for deaf or hard of hearing students because they cannot see the speakers face well or an interpreter may be located in shadows. Arranging seating accordingly can help minimize these effects.

Available Technology

Many schools have implemented technology that improves access for all students. Technology such as computers, televised announcements, sound field amplification systems, and interactive white boards can have positive impacts for all students, but especially those that are deaf or hard of hearing.

Sensory Considerations

In addition to being deaf or hard of hearing, these students may have the same kinds of sensory challenges that other students face. Any additional challenges need to be addressed accordingly, but are beyond the scope of this chapter. See Chapter 14 - Assistive Technology for Students with Multiple Challenges for information on students who may be deaf blind and have cognitive disabilities.

Tasks

The goal of this chapter is to increase awareness of the challenges faced by deaf or hard of hearing students to access information to the same extent as other students. Each team needs to be knowledgeable about how a given student uses their residual hearing, vision and other senses to access information in different environments. Be specific when outlining the tasks that need to be supported. Rather than stating “participate in class”, state “give class presentation” or “participate in small group discussions.”

Narrowing the Focus

As mentioned in other chapters and based on the Assistive Technology Decision Making Guide, the team should generate a list of tasks or activities and the associated challenges with accessing information. This will allow the team to identify the greatest challenges and prioritize what can be done to support the student. The goal is to provide the deaf or hard of hearing student access to all of the information others access through their hearing, and a way to demonstrate their understanding.

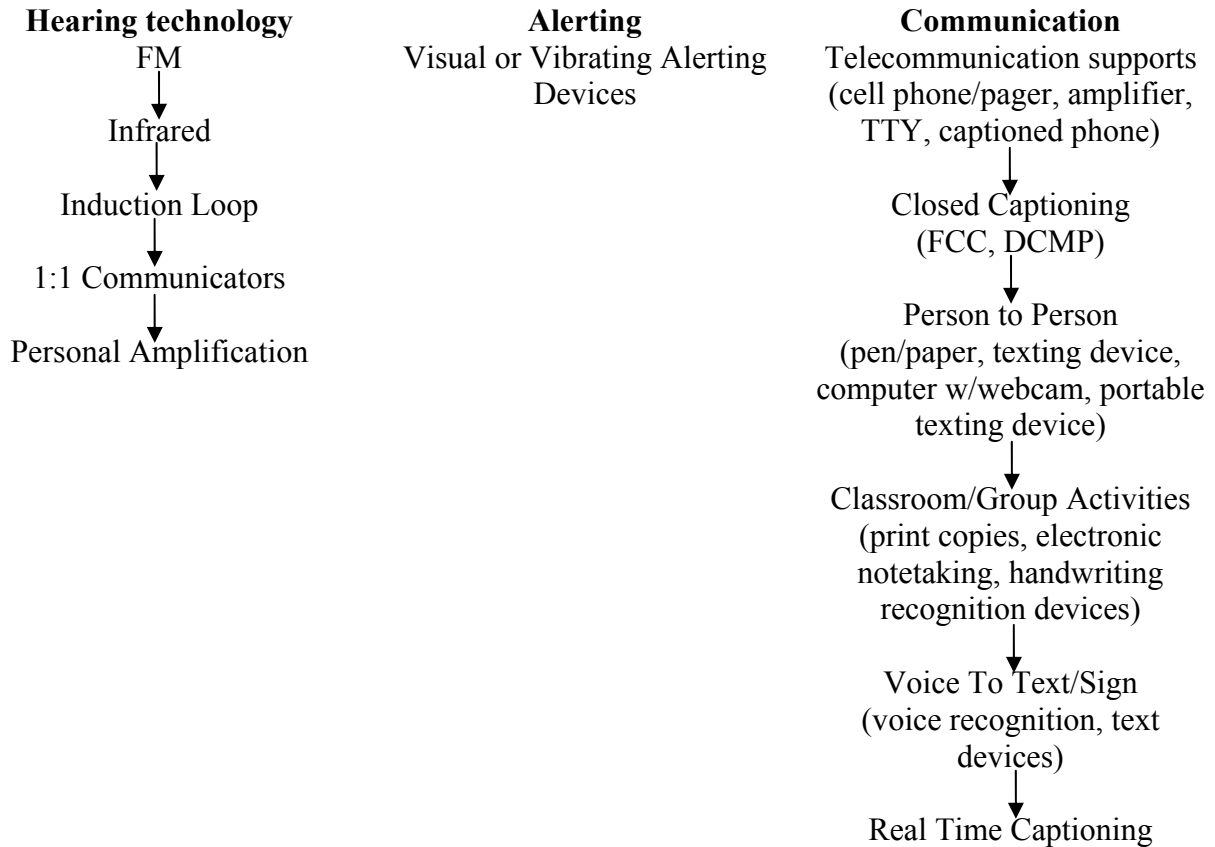
Solution Generation-Tools and Strategies

Often there are multiple solutions and outlining them through brainstorming and using a feature match process can help determine which have the greatest impact across the most environments. Readers are reminded that each deaf or hard of hearing student will access information differently and what works for one may not necessarily work equally as well for another. Assistive technology for deaf or hard of hearing students often has profound impact on their ability to access information and be part of a community, both for school and home. Some devices are more appropriate for school environments while others are more home and community based. This chapter has attempted to introduce the reader to general categories of devices as well as a few specific tools. It is important for the team to remember that accessibility needs are highly variable and may require different technologies over time, within different environments and even among students. Support from a teacher of the deaf and hard of hearing and/or educational audiologist will help the team identify strengths and challenges for each individual student.

Classifications Of Technology

Assistive technology for the deaf or hard of hearing can be grouped into three general categories: Hearing technology; alerting devices; and communication supports. Within each category, there are numerous manufacturers and a multitude of models that are updated and improved frequently. Due to the large number of devices and ever changing technology, general explanations of each type will be given and the reader will be directed to the Resource section to obtain a sampling of manufacturer websites for additional information or to resource locations that provide demonstrations or lending of multiple products. Related to deaf and hard of hearing technology, it is often difficult to maintain a hierarchy of “low to high” technology. Most often, the decision for one type over another is based on particular needs related to specific features and may vary over time or for different environments or situations. To the extent possible, technologies will be explained in a “low to high” order.

A Continuum of Considerations for Assistive Technology for Individuals who are Deaf or Hard of Hearing



A Chart with Examples For the Continuum Of Considerations For Assistive Technology For Individuals Who Are Deaf Or Hard Of Hearing

Hearing Technology	Alerting Devices	Communication Supports
Assistive Listening Device: <ul style="list-style-type: none"> • FM • Infrared • Induction Loop • 1:1 Communicators 	<ul style="list-style-type: none"> • Baby Monitor • Clock / Watch • Computer • Door Bell / Knock • Fire / Carbon Monoxide Detector • Telephone / Cell Phone • Weather 	Telecommunication: <ul style="list-style-type: none"> • Cell Phone / Pager / Text Device • Amplified Phone / Amplifier • TTY/TDD • Captioned Telephone • Telecommunication Relay Service • Computer/ Web Camera • Internet Protocol Relay • Video Phone • Video Relay Service Closed Captioning: <ul style="list-style-type: none"> • FCC • DCMP
Personal Amplification: <ul style="list-style-type: none"> • Hearing Aid 		Person to Person: <ul style="list-style-type: none"> • Pen / Paper • Cell Phone / Pager / Text Device • Computer / Web Camera • Commercial Devices <ul style="list-style-type: none"> ○ UbiDuo
		Group Activities: <p>Note taking:</p> <ul style="list-style-type: none"> • Copies • Computer-assisted note taking • Handwriting recognition <p>Devices:</p> <ul style="list-style-type: none"> ○ Digital Pen ○ White Board <p>Voice to Text/Sign:</p> <ul style="list-style-type: none"> • Caption Mic • Dragon Naturally Speaking • iCommunicator • Video Remote Interpreter <p>Real Time Captioning:</p> <ul style="list-style-type: none"> • CART • CPrint • Remote Captioning

Hearing Technology

Hearing Technology can broadly be defined as any device utilized for improving the level of sound available to a listener. Hearing technology can further be divided into two general subcategories of assistive listening devices (ALD) or personal amplification. Assistive listening devices can be utilized by individuals or large groups of people and can typically be accessed without the support of specific personnel. Personal amplification is chosen specific to the needs of an individual based on their level of hearing and requires the support of an audiologist to determine candidacy for different devices and appropriately fit and adjust the chosen device.

Assistive Listening Devices

These devices typically are used to improve the signal-to-noise ratio in any given situation. In addition to increased volume, ALDs provide the listener with a direct connection to the sound source and help minimize the effects of background noise, distance and room acoustics. There are both individual ALDs and public or large group ALDs. All ALDs utilize a transmitter that sends a person's voice or other sound source to a receiver that distributes the sound evenly throughout a room such as in theaters and churches or directly to an individual. Sound is transmitted in four primary ways: Frequency Modulation (FM); Infrared (light); Induction Loop (electromagnetic); or through a direct connection. Some hearing aids have a special connection option called Direct Audio Input (DAI) that allows the user to connect directly to an FM system or Induction Loop receiver. In many instances, one can even connect directly to other devices such as a computer, TV, MP3, iPod, or radio.

FM: With FM or Frequency Modulation systems, the sound is transmitted on a specific frequency or channel similar to a radio. The Federal Communications Commission (FCC) has designated specific frequencies for these types of systems. FM systems can be used for whole rooms or by individuals. Large areas can be set up with single or multiple speakers depending on the size of the room. These systems can be permanently installed in a given location or there are also several versions that are portable. Individual systems typically have a receiver that looks like a Walkman or MP3 player and uses different styles of earphones or headsets and may be useful for 1:1 communication, car rides, and watching TV. With miniaturization, there are now small receivers that can be connected directly to a person's hearing aids through Direct Audio Input (DAI). Any time an FM system is coupled to a hearing aid, special settings and connections are required from an audiologist. Sometimes when several FM based systems are used in the same building, there can be problems with cross over between rooms and channels.

Infrared: These systems utilize light waves to transmit sound from the transmitter to a special light sensitive receiver. The signal can be broadcast to a whole room through speakers or a person can wear an individual receiver. There must be a clear line of connection between the transmitter and receiver so that the light signal is not interrupted. The benefit of infrared systems is that they only work in the room where the transmitter and receiver are located resulting in significantly fewer issues with cross-over. These systems can be sensitive to external light sources or interfering objects.

Induction Loop: Induction loop systems utilize electromagnetic energy to transmit the signal. These systems can cover a small area with a loop placed under a rug or may be

permanently installed within the walls or ceiling of larger areas like theaters, auditoriums or churches. For individuals to access this type of technology, they must have a Telecoil (t-coil) within their hearing aids.

One-to-one communicators: These types of systems tend to require that the listener and sound source are close together because the transmitter and receiver are connected by a wire or cord that transmits the sound. The person using the system can adjust the volume as needed to hear conversation from another person, listen to TV, or while riding in the car.

Personal Amplification

These devices are designed to provide an individual with increased access to sound across all environments. They are chosen based on an individual's preferences, degree and configuration of hearing loss, and special features. Devices in this category must be obtained and fitted through an audiologist. Although many sources do not consider personal amplification as assistive technology, assistive listening devices and other auditory-based devices (MP3, TV, computer) may be connected through these systems, so they will be explained briefly. Also, some funding sources provide resources for personal amplification under the category of assistive technology.

Hearing Aid: There are numerous manufacturers of hearing aids, but all have the same basic components and purpose of amplifying sound. Styles of hearing aids include behind-the-ear (BTE); in-the-ear (ITE); and in-the-canal (ITC). They vary based primarily on size and features. In the past, most hearing aids had analog circuits that processed sound in a linear fashion so that what came in was made louder in equal amounts. Today with improvements in technology, most hearing aids are digital and programmable which allows them to be set very specifically based on each individual's hearing level at different frequencies. Many have special processing capabilities that help improve speech recognition, noise reduction, and overall performance. Many hearing aids include a telecoil (t-coil) or telephone switch that allows the user to access the electromagnetic energy in telephones as well as many publicly available assistive listening devices (ALDs). There is also the option of having a hearing aid integrated with an FM system that does not require direct audio input (DAI) or connection to other devices.

The following two devices are not assistive technology as defined by law (IDEA I.). School personnel may need to understand them in order to appropriately use compatible assistive listening devices.

Cochlear Implant: A cochlear implant (CI) is a surgically-implanted device that converts sound energy into electrical stimuli that can be processed by the auditory nerve. There are specific criteria that must be met in order for a person to be a CI candidate. There are three CI manufacturers: Advanced Bionics; Cochlear Americas; and Med-El. Readers are referred to their websites within the Resources section for additional information. Most offer multiple options including body worn and ear level processors. Most have the ability to connect to assistive listening devices (ALDs) and other external devices.

BAHA™ – Bone Anchored Hearing Aid: The BAHA is another surgically implanted device available through Cochlear Americas that is most often utilized in cases of severe conductive hearing loss related to anatomical malformations, chronic middle ear problems or Single Sided Deafness™. There is a soft headband option that can be utilized until surgery can be completed at approximately five years of age. This device is also compatible with ALDs.

Alerting Devices

Alerting devices typically provide an amplified and/or visual signal or vibration used to get the attention of the deaf or hard of hearing individual. They can be used for public emergency alerts like fire alarms and tornados or for every day situations like the telephone ringing or a baby crying. Many offer both household and travel sized versions. For alerting devices, there are numerous clearinghouses for purchasing devices as well as lending libraries or demonstration centers. The reader is referred to the Resource section for additional information. Devices that can be utilized with alerting technology include the following:

- Baby Monitor
- Clock / Watch
- Computer
- Door Bell / Knock
- Fire / Carbon Monoxide Detector
- Telephone / Cell Phone
- Weather

Communication Supports

Within Communication, assistive technology devices have been divided into three subcategories: telecommunication services; person-to-person interactions; and group activities. As before, general explanations will be given with additional contact information provided within the Resources section.

Telecommunication:

Cell Phone / Pager / Text Device: Many commercially available devices can be used by deaf and hard of hearing consumers without modifications. Cell phones may list that they are hearing aid compatible, supporting the use of telecoil/telephone switches to utilize the electromagnetic energy within the phone itself. In addition, any pager or cell phone that has text capabilities can now be used for sending text messages, instant messages, or email.

Amplified Phone / Phone Amplifier: A phone may have a built in amplifier or may be connected to an external amplifier. Regardless if the amplification is internal or external, it allows the user to increase the overall volume to their comfort level. This feature is available to some extent in regular phones and cell phones, but there are also specialized

phones or external attachments designed specifically for hard of hearing users that provide even greater output levels.

TDD/TTY: Telecommunication Device for the Deaf (TDD), previously known as teletype machine (TTY), allows the user to place phone calls using text through a regular phone line. Each TDD has a keyboard with a text screen. A user either needs to connect with another person that has a TDD or use a relay service that can convert the text into voice for the hearing listener receiving the call. Models range from basic to high-end with additional options such as printers, answering machines, and memory to save text or messages. With improvements in technology for phones, pagers, text devices and computer services, the use of the TDD is declining.

Captioned / Text Telephones: Similar to the specialized amplified phones or TDD, captioned telephones allow the user to see text of their telephone conversation as well as access relay services.

Telecommunications / Telephone Relay Service: When placing a call to another party without a TDD, the deaf or hard of hearing consumer dials into the relay service and provides the phone number they wish to call. The relay operator dials the number and explains the relay service and how to use it. Once the two parties are connected, the operator will voice all of the text messages for the hearing person and convert all of their verbal replies into text for the deaf or hard of hearing caller. This process also works in reverse when a hearing person wants to contact a deaf or hard of hearing person.

Telecommunications / Telephone Relay with Voice Carry Over (VCO): Another component of using the relay service is for deaf or hard of hearing callers who can voice for themselves, but cannot hear on the phone. They can utilize the relay service to have what is said by the hearing person they called typed for them to read and they can speak for themselves.

Computer / Web Camera: Many individuals utilize the combination of a web camera and computer Internet service to be able to visually connect with others. This readily available technology has been used increasingly by deaf and hard of hearing individuals to expand their communication options. This set-up can be utilized to access an IP relay service using sign language instead of text.

Internet Protocol Relay (IP): The increasing use of computers has resulted in additional telecommunication services for deaf or hard of hearing individuals. Callers can now use their computers to place phone calls through a relay service rather than their phone and TDD. The concept is the same; the deaf or hard of hearing person uses their computer to connect with an IP relay service. The operator places the call, identifies themselves and the relay service, and facilitates the exchange of information through text and voicing.

Video Phone: One of the newest telecommunication devices available for deaf or hard of hearing callers that communicate through sign language is a video phone. A small

camera and TV display is needed as well as high speed internet service. The deaf or hard of hearing person is able to sign for themselves in direct communication with other video phone users.

Video Relay Service: In the same fashion as telephone relay, video relay service can be accessed to allow the sign language user to call other hearing people with the assistance of an operator. As with other relay services, the operator identifies themselves and the relay call process. They then proceed to voice interpret the signed message from the caller. They are also able to convert the voice message into sign language for the deaf or hard of hearing person.

Closed Captioning:

FCC: The Federal Communication Commission (FCC) has developed regulations related to the provision of closed captioning within public programming. Closed captioning allows for a text display of the spoken dialogue contained within television programs and movies. As of 1993 all televisions with screens larger than 13 inches must have built in captioning. In 2002, the FCC expanded the rule to include all digital television receivers. There are also closed captioning decoders that can access captioning when not available within a television or projection system. Closed captioning encoders allow for captions to be added to live broadcasts or existing materials. In addition, many commercially available movies include captioning within their language or subtitle set-up features. For additional information regarding closed captioning, the reader is referred to the FCC website listed in the Resources section.

DCMP: The Described and Captioned Media Program is a FREE LOAN service that has thousands of educational titles to ‘stream’ and view on a computer immediately or DVD’s for order that can be sent to home or school.

Person to Person: Options available for a deaf or hard of hearing person to communicate directly with a hearing person have exploded with the increased use of cell phones with text capabilities, computers with internet service and overall public awareness.

Pen / Paper: The most basic communication tool that can be used between a deaf or hard of hearing person is a pen and paper. Writing notes back and forth can be time consuming, yet effective.

Cell Phone / Pager / Text Device: Numerous texting options are now available through computers, pagers or cell phones for sending text messages, instant messages and email.

Computer / Web Camera: Web cameras combined with high speed internet service have also become more widely used to help deaf or hard of hearing individuals communicate with others.

Commercial Devices: Several devices have been developed to allow deaf or hard of hearing individuals to communicate directly with hearing people by allowing individuals the means to exchange type written messages that can be considerably faster than writing.

Example:

UbiDuo Face to Face Communicator™: This device consists of two portable battery operated keyboards with displays that have a wireless connection that allow the deaf or hard of hearing person to communicate with a hearing person instantly through type written messages.

Group Activities: Communicating and accessing information within group environments such as lectures, discussions, programs and community events can be especially challenging for deaf or hard of hearing individuals. There are several types of assistive technology that can assist in providing the information through a visual means such as text or sign language. Because there are fewer options and manufacturers for this type of technology, specific examples will be provided within the text as well as websites within the Resources section.

Note taking: Often times, deaf or hard of hearing individuals find it difficult to watch the speaker or interpreter and take notes at the same time. Each time they look to their paper, they miss the information that continues to be presented. There are several options for assisting with note taking.

Copies – teacher / participant notes: Copies of the teacher's or another participant's notes can be provided. Duplication paper can still be obtained or most facilities now have copy machines available.

Electronic note taking: An individual can be trained and/or paid to take notes using a computer or portable word processor to provide a written summary of lectures, meetings and discussions.

Handwriting recognition devices: There are commercially available products that convert hand written materials into computer-generated text. Depending on the device, the information can be saved and printed as written or can convert the hand written materials into printed text for easier reading similar to a voice recognition system.

Digital Pen™: This system allows the user to combine the use of pen and paper with the power of a computer. The software converts your handwritten notes into digital text. The user can modify the hand written text or convert it to text.

Interactive Whiteboards (SMART Board™): The touch-sensitive display connects to your computer and digital projector to show your computer image. The user can then control computer applications directly from the display, write notes in digital ink and save your work to share later.

Voice to Text / Sign: There are several commercially-available products that utilize voice recognition software to convert voice to printed text or computer-generated sign language. These devices are seeing increased use for a variety of situations. Sometimes the recognition is not exact and the deaf or hard of hearing consumer must be able to recognize when errors occur. The

speaker needs to work with the specific device to train it to recognize their voice. Some allow only one user, but others are beginning to recognize multiple speakers.

Caption Mic™: With minimal practice, a voice captionist repeats what was said by an instructor into a microphone that converts the information to captioning to be read by the deaf or hard of hearing individual.

Dragon Naturally Speaking™: A voice recognition software package that was developed for general public use that can be beneficial for deaf and hard of hearing individuals by creating text documents out of voice files.

iCommunicator™: Performs as a communication tool that converts the spoken word into text, instantly translating it into Sign-Language or Computer-Generated Voice, providing access to acoustic information in real-time. This software is able to convert speech to text; speech/text to video sign-language; or speech/text to computer generated voice.

Video Remote Interpreter: When an interpreter is not available to attend a function in person, video remote interpreting provides another option. Utilizing a phone or other computer devices or software, an interpreter in another location can listen to a presentation and use sign language to relay the information presented through a web camera or video phone. High-speed Internet service is required to access this type of remote interpreting. The deaf or hard of hearing consumer can view the signed information on a computer or video telephone.

Real Time Captioning: Real time captioning provides a typewritten account of all verbal information presented within a lecture, meeting, discussion or presentation. All of these systems require the skills of a trained captionist and specialized software or equipment such as a computer. They typically vary based on the amount of information represented within the visual display of information ranging from summaries to word for word transcription.

CART (Communication Access Real Time Captioning) - Provides a word-for-word transcription (similar to a court reporter) using a stenotype machine, laptop computer and real time software.

CPrint – Developed as a speech to text communication access system at the National Technical Institute for the Deaf (NTID), a college of Rochester Institute of Technology (RIT). This system condenses information using a meaning-for-meaning translation (not verbatim).

Remote Captioning: Rather than having a captionist physically present, the user can listen in using a phone, cell phone, or computer microphone which allows the captionist to transmit the text back to the consumer using a modem, internet or some other data connection.

Selection: Tools & Strategies

Use a Feature Match process to discuss and select those ideas, tools, and strategies that were generated during the solution brainstorming. Select those that best match the student, the environment and the tasks that need to be accomplished. Limit your selections to a reasonable number and prioritize them according to those that can be accomplished immediately, in a reasonable time period and those that will be considered at a later time or require additional or significant staff training.

Implementation Plan

Depending on the device/s chosen, they may be able to be purchased or loaned for such things as alerting and telecommunication devices. However, many others such as personal amplification or captioning services require specialized equipment or software and/or support personnel including audiologists, trained captionists or interpreters. Determining benefit of a particular device or service should be implemented through a trial period to make sure what was chosen is meeting the needs of the student. Input regarding improved accessibility should be obtained from the student themselves as well as the team and family.

References and Resources

Deaf and Hard of Hearing Information

American Speech Language Hearing Association www.asha.org

Hearing Loss Association of America www.hearingloss.org

National Association of the Deaf www.nad.org

Office of the Deaf and Hard of Hearing (ODHH) <http://dhs.wisconsin.gov/sensory>

WI Department of Public Instruction www.dpi.wi.gov

Students who are Deaf or Hard of Hearing: Eligibility Criteria Guidelines (2003)

Retrieved December, 2008

<http://www.dpi.wi.gov/sped/pdf/dhhguide.pdf>

WI Educational Services Program for the Deaf and Hard of Hearing (WESPDHH)
www.wesp-dhh.wi.gov

Product / Website Resources

Assistive Listening Devices

Audio Enhancement www.audioenhancement.com

LightSPEED Technologies www.lightspeed-tek.com

Lifeline www.lifelineamp.com

Oticon www.oticonus.com

Phonak www.phonak.com

Sonovation www.avrsono.com

William Sound www.williamssound.com

Captioning

Communication Access Real Time Captioning www.cartinfo.org

C-Print Rochester Institute of Technology www.ntid.rit.edu/CPrint

Described Captioned Media Program (DCMP) www.dcmp.org

Federal Communication Commission www.fcc.gov/cgb/consumerfacts/closedcaption.html

Cochlear Implants / Baha

Advanced Bionics www.bionicear.com

Cochlear Americas www.cochlear.com

Med-El www.medel.com

Hearing Aid Companies

GN Resound www.gnresound.com

Micro-Tech www.hearing-aid.com

Rexton www.rexton-online.com

Siemens www.usa.siemens.com

Starkey www.starkey.com

Unitron www.unitronhearing.com

Widex www.widexPro.com

Products

ADCO Hearing Products www.adco.com

Harris Communications www.harriscomm.com

Hear More Products for the Deaf and Hard of Hearing www.hearmore.com

Signaling Devices

HiTec Group, Inc www.hitec.com

Sonic Alert www.sonicalert.com

Ultratec Inc. www.ultratec.com

Specific Technology Related Products

Caption Mic www.captionmic.com

Digital Pen www.logitech.com

Dragon Naturally Speaking www.nuance.com/naturallyspeaking

iCommunicator www.mycommunicator.com

SMARTBoard Interactive White Boards– www.smarttech.com

UbiDuo Face-to-Face Communicator www.scommonline.com

Telecommunications Services

CSD-VRS Communication Service for the Deaf www.c-s-d.org

Hamilton Relay Inc. www.hamiltonrelay.com/states/wi.htm

Hands-On Video Relay Service (HOVRS) www.hovrs.com

Sorenson Communications www.sorenson.com

Wisconsin-based AT Demonstration Sites

Assistive Technology Resource Center www.wiatrc.org

Independence First www.independencefirst.org

Stout Vocational Rehabilitation Institute www.svri.uwstout.edu

UniversaLink www.cdhh.org

WATI Lending Library www.wati.org

Products Mentioned in Chapter 8

Product	Vendor Website
Caption Mic	www.captionmic.com
Digital Pen	www.logitech.com
Dragon Naturally Speaking	www.nuance.com/naturallyspeaking
iCommunicator	www.mycommunicator.com
SmartBoard Interactive White Boards	www.smarttech.com
UbiDuo Face to Face Communicator	www.scommonline.com