Gallaudet's Proposed Research Priorities

By Michael A. Karchmer*

From now until July 9, 2004, the GRI is soliciting feedback regarding Gallaudet's proposed twelve research priorities for the next several years. Some items are revised from the priority list already in use at the university; others are new. Gallaudet uses this list to encourage and support research that aims to benefit deaf and hard of hearing people in a

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variety of ways on Gallaudet's campus, across the U.S., and beyond this country's borders. The priorities also encourage research aimed at meeting the university's long-term goal of identifying and providing educational services to deaf and hard of hearing people of all ages in ways that reflect best available practices.

The twelve priorities proposed below are the result of a collaborative process involving the campus research community and off-campus constituencies. The order is not meant to reflect relative importance. Please note that the term "deaf and hard of hearing" should be interpreted broadly to refer to a diverse population of individuals.

If you have comments or suggestions, you are encouraged to send them to me, Dr. Michael A. Karchmer, Director, Gallaudet Research Institute, HMB S-437, Gallaudet University, 800 Florida Avenue NE, Washington, DC 20002 or contact me via e-mail at gri.offices@gallaudet.edu.

Proposed Gallaudet Research Priorities

1. Literacy. Basic research into the sensory, cognitive, linguistic, and socio-cultural processes involved in deaf and hard of hearing people's acquisition of language and literacy from infancy through adulthood, as well as

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applied research concerning ways to achieve English literacy. This may include the study of how ASL literacy supports English literacy.

2. Teaching, Learning, and the School Environment. Research on such areas as effective strategies for teaching deaf and hard of hearing students; the impact on learning of students' cognitive processes, learning styles, and linguistic, cultural, and educational backgrounds; and the ways school environments affect accessibility of information and educational success. Studies may focus on particular content areas, such as mathematics, history, science, art, etc.

3. Assessment. Development and validation of tools, techniques, and models (including standardized and authentic approaches) for assessing a wide range of characteristics of deaf and hard of hearing people from infancy through adulthood, including specific academic knowledge, skills, interests, aptitudes, and social and emotional characteristics.

4. ASL Acquisition. Research aimed at understanding the processes by which individuals acquire ASL. This priority applies both to first-language learners acquiring ASL in childhood and to second-language learners acquiring sign language later in life. Basic research may examine naturalistic learning situations, and applied research may seek to determine optimal strategies for ASL instruction.

5. Home, School, and Work Transitions. Research aimed at understanding and improving the transitions of children from home to school, of students from high school to work or post-secondary education, and from post-secondary education to employment. Studies may also address issues pertaining to emotional intelligence, peer relations, self advocacy, community involvement, and career advancement.

6. School and Family Relationships. Research aimed at understanding family-school relationships and family dynamics in families with deaf or hard of hearing members. Studies might include parent-child interaction, sibling relationships, and intergenerational research as well as family involvement focusing on successful strategies for encouraging the active participation of parents of deaf and hard of hearing children within school environments.

7. Studies That Inform Public Policy Development and Educational Planning. Research and dissemination of data essential to the development and evaluation of educational planning and public policies on education, medicine, counseling, social work, interpreting, and other services used by deaf and hard of hearing people throughout their lives. Studies may focus on specific groups, on agencies and institutions providing services, or on the social, economic, and political processes in which deaf and hard of hearing people are involved. The role of genetic discoveries, the increasing use of cochlear implants, and the impact of federal and state education legislation on deaf and hard of hearing individuals are particularly timely areas of study.

8. Language, Culture, and History of Deaf People. Research aimed at linguistic, sociolinguistic, anthropological, and historical studies of deaf culture, sign language, and the experiences of deaf people in the United States and cross-culturally. Studies may focus on the construction of diverse deaf or deafness-related identities (such as deaf/blind people, deaf people from racial/ethnic minority groups, deaf individuals with multiple disabilities, and children of deaf adults); deaf ways of knowing; and the emerging field of visual epistemologies. Studies of literature, the visual arts, and other creative, political, and social contributions of deaf people may be included.

9. Development and Evaluation of Technologies That May Benefit Deaf and Hard of Hearing People. Studies of technology and media aimed at enhancing the education and communication access of deaf and hard of hearing people. This would include evaluation of emerging technologies, studies of innovative applications of technology, and evaluation of the accessibility to deaf and hard of hearing consumers of new technology, media and collaborative efforts to shape the direction of future technological developments and accessibility. Applies to a broad range of visual and audiological technologies.

10. Hearing Loss and Aging. Studies of the nature and consequences of hearing loss in adulthood and within the elderly population.

11. Psycho-Social Development and Mental Health Needs. Research aimed at identification of issues affecting deaf and hard of hearing people's cognitive and psycho-social development and at describing and meeting the mental health needs of deaf and hard of hearing individuals throughout their lives. Studies might evaluate strategies to facilitate adjustment in different settings and address issues of psychological assessment, diagnosis and accessibility of mental health services for deaf and hard of hearing people.

12. Interpretation. Research examining the cognitive, linguistic, technical, ethical, socio-cultural processes and practices involved in interpreting for deaf, hard of hearing, deaf-blind, and hearing individuals in a broad range of workplace, medical, legal, educational, social, and cultural settings. This priority may address situations involving use of and access to English and ASL, other spoken and signed languages, or other visual or tactile communication systems.

Hearing Enhancement Project Underway

By Matthew Bakke*

Matthew Bakke

The Rehabilitation Engineering Research Center on Hearing Enhancement (RERC-HE) is a five-year project with the mission of building and testing components of a new model of aural rehabilitation tools, services, and training for the purpose of: 1) improving assessment and fitting of hearing technologies; and 2) increasing availability, knowledge, and use of hearing enhancement devices and services in order to assure a better match between technologies and individuals in their natural environments.

This project is funded by the National Institute on Disability and Rehabilitation Research (NIDRR) which is an agency of the United States Department of Education. The RERC-HE is a collaborative project of Gallaudet University, the Graduate School of the City University of New York, Self Help for Hard of Hearing People, Inc., and Advanced Hearing Concepts, Inc. Its total budget averages $1,060,000 annually, of which $950,000 is provided by NIDRR, with the remaining funds contributed by the grantees. The project began on October 1, 2003 and will continue until September 30, 2008.

*Dr. Matthew Bakke, a professor in Gallaudet's Hearing, Speech, and Language Sciences Department, is the overall Project Director of the RERC-HE. He says, "as such, I have input into the design of all of the research and development projects, work with our internal review committee and advisory board to evaluate our progress, produce annual reports, and direct dissemination efforts. In addition, I have prime responsibility for the component of the project dealing with CEDAR: Computer-Enabled Distance Aural Rehabilitation."

The RERC-HE is made up of sixteen sub-projects grouped under six main areas of emphasis:
* Hearing Aids
* Hearing Assistive Technologies
* Environmental Factors: Classrooms
* Tools for Hearing Assessment and Intervention
* Computer Enabled Distance Aural Rehabilitation (CEDAR)
* Training and Dissemination

Hearing Aids

Field Evaluation of Hearing Aids

The purpose of this project is to develop new methods and technologies for the field evaluation of advanced hearing aids. Evaluation of hearing aid performance usually takes place in a clinical setting. Past research has shown that performance in the clinic is not necessarily predictive of performance in the real world. [1,2,3] Currently, there are no standard test procedures that replicate real-world characteristics for hearing aid testing. In the proposed method, a wearable computer system is used to measure the perceived sound quality and benefit of hearing aids in the users' real environments, while simultaneous acoustic recordings are made of the sound reaching the users' ears. This procedure, which implements an "ecological momentary assessment" technique,[4] will enable the collection of information about

how well a hearing aid works in different environments for people with differing degrees of hearing loss. Once perfected, this methodology could be used by manufacturers and researchers when testing the feasibility of new signal processing techniques and by clinicians in evaluating efficacy of devices for individuals with hearing loss. Ultimately, the information obtained using this methodology should lead to the ability to improve user performance and satisfaction with hearing aids in multiple environments.
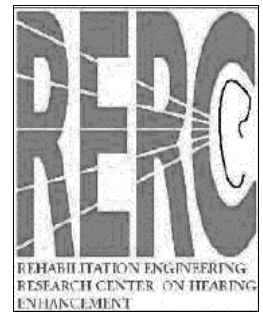
Auditory Self-monitoring

The goals of this project are to develop methods and tools for the assessment of self-hearing of users of hearing technologies and to examine the need for alternative fittings based upon users' perception of their own voices. Currently, there is little research data that is helpful in understanding how users of hearing technology perceive their own voices, or how that perception affects their use (or non-use) of amplification. It is well known that ear canal occlusion by a hearing aid often results in low frequency amplification of the vibrations from the user's own voice, and consequently, complaints about the excessive loudness and hollow quality of speech feedback.[5,6] In addition, the processing used in digital hearing aids and cochlear implants can result in delays of the amplified sound of up to several hundred milliseconds. These delays are likely to be disturbing to the user and may interfere with speech production.[7,8]

The results of this work are expected to lead to better strategies for fitting cochlear implants and hearing aids that take into consideration the user's self-hearing. This issue is of particular importance in children who rely on self-hearing for speech and language development.

Hearing Aid Interference from Wireless Phones

The use of wireless telephones has increased greatly over the past few years. Unfortunately, current wireless phones use digital technology that generates audible distortions in hearing aids. The RERC-HE, in partnership with the RERC on Telecommunications Access (also at Gallaudet University), has been working with consumer organizations, the telephone industry, and the hearing aid industry over the past 6 years to find ways to reduce the effects of this interference. A method for measuring and categorizing the electromagnetic field produced by a wireless telephone and the hearing aid's immunity to an electromagnetic field has been developed,[9] which should make it possible to predict how well a person with a hearing loss will be able to understand speech for different

combinations of hearing aids and wireless telephones. The purpose of this project is to develop and evaluate a practical technique for predicting the amount of electro-magnetic interference that is audible to the hearing aid user for a given hearing aid-wireless telephone combina-tion. It will then be possible to predict the user's ability to understand speech in the presence of this interference.

Hearing Assistive Technologies

Two projects are planned under this component of the RERC: A user survey on Assistive Listening, and the development and evaluation of a Universal Wireless Receiver that will allow the user to receive signals from any of the wireless technologies that are used to provide auditory access in public venues.

The user survey, currently under development, will provide new information to help better understand hearing aid and cochlear implant users' experiences with assistive listening devices and systems (ALDS). The results will be used to guide the work of the RERC-HE over the next five years, as well as work on standards aimed at improving the usability of ALDS. The results will also be useful to industry, clinicians, and those in government concerned with communication accessibility via ALDS under the ADA and other statutes.

Environmental Factors: Classrooms

The importance of the barriers imposed by the acoustic characteristics of classrooms is becoming better understood as education and audiology professionals seek to improve acoustic environments in schools through the development of standards. [10] Studies of the speech recognition performance of children in acoustic environ-ments that are typical of classrooms have demonstrated severe decrements in speech understanding,[11,12] with the greatest impact on the youngest children.[13] However, the impact of actual acoustic conditions experienced in various classrooms and seating locations has not been well

Classroom acoustics have a great impact on children's ability to understand the teacher, not only for children with hearing loss, but for all children. Environmental modifications, such as lower ceilings, acoustic ceiling tiles or carpeting in the classroom are a great way to reduce the amount of reverberation.
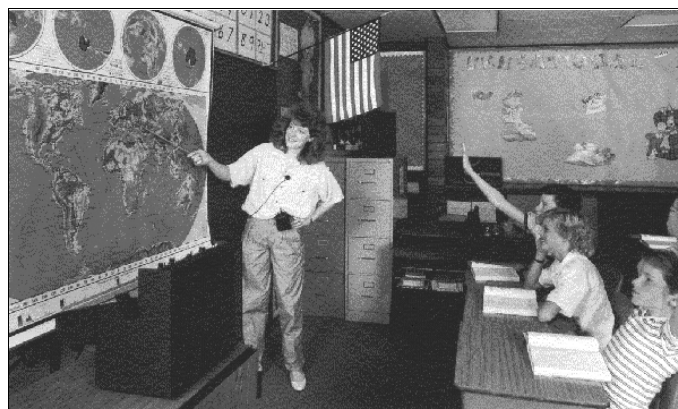
The use of assistive listening devices, especially in the classroom, can help bring the speaker's voice directly to the listener.

studied in either children with normal hearing or children with hearing loss.

The primary goal of this project is to empirically determine the effects of noise, distance, and reverberation on children's speech recognition abilities in various classrooms and locations within those classrooms. A useful model has been developed by Arthur Boothroyd for predicting the effects of noise, distance, and reverberation on speech recognition, as well as the enhancement of speech intelligibility provided by the introduction of sound field technology into a classroom.[14] A second goal is to validate the Boothroyd model for predicting the effects of classroom acoustics on the speech recognition abilities of pre-school and school-aged children and to measure the benefits and limitations of classroom sound field technology for children 3 to 12 years of age in classrooms that are examples of intrinsically 'good', 'fair', and 'poor' acoustical properties.

It is expected that by better understanding the variables that affect children's speech understanding in classrooms, predictive measures such as the Boothroyd model can be used to better adapt classrooms to maximize auditory communication.

Tools for Hearing Assessment and Intervention

The use of distortion product otoacoustic emissions (DPOAE) and reflectance for diagnosis of hearing loss and tinnitus

The aim of this project is to investigate techniques for improving measurement of cochlear and middle ear function by combining measurements of DPOAEs with measures of reflectance. Otoacoustic emissions (OAEs) are sounds generated by the healthy inner ear and detected by placing a sensitive probe in the outer ear canal.[15] DPOAEs result from distortions introduced by the activity of healthy outer hair cells when pure tones with specific combinations of frequency and level are introduced to the ear. Reflectance measures similarly provide a way to

characterize the makeup of the middle ear, which may be affected by pathologies such as middle ear effusion. The combination of these two types of measurement will not only help in the diagnosis of cochlear and middle ear pathology, but will also contribute to an improved means for reducing variability in the measurement of DPOAEs. Furthermore, the measurement of distortion product input/output functions may make it possible to obtain estimates of hearing loss, differentiate inner hair cell from outer hair cell pathology, and identify the etiologies of tinnitus.

*Synthesized Speech for
Hearing Aid Research*

This project is designed to investigate whether or not synthetic speech can be used as a substitute for recorded natural speech in hearing aid research, and ultimately for clinical assessment and intervention. It has been demonstrated that highly intelligible speech that is nearly indistinguishable from recorded speech can be generated by copy-synthesis methods using a formant-based synthesizer.[16] Synthetic speech offers precise control and modification of speech signals, which would potentially enable researchers and clinicians to easily generate new assessment and intervention materials specifically designed to match individuals' interests and hearing characteristics. This research will test the hypothesis that synthetic speech is appropriate for such applications and can provide the same perceptual information as recorded natural speech.

Computer Enabled Distance Aural Rehabilitation (CEDAR)

The objective of this component of the RERC-HE is to develop a new, innovative model for the delivery of aural rehabilitation (AR) services to adults with hearing loss, known as CEDAR. This project will take advantage of current and developing telecommunications and information technologies to provide services as independently and cost-effectively as possible within a framework of professional guidance, direction and monitoring. The program is ambitious, and will be

Otoacoustic emissions (OAEs) are sounds generated by the healthy ear and detected by placing a sensitive probe in the outer ear canal. The first graph is an example of OAEs from a functioning cochlea, the second graph depicts a sensorineural hearing loss, and the third depicts a high frequency hearing loss.

developed gradually using a modular design. Each module will be made available in as many formats as possible, but most importantly will be available for downloading or for directly using on-line. During this 5-year cycle of the RERC, several modules of the CEDAR model will be developed and evaluated. These modules are discussed below:

Receptive Communication Needs Profile

The goal of this project is to develop, evaluate, and validate a software program designed to assist audiologists in analyzing individual receptive communication needs and selecting appropriate hearing technology for individuals who are deaf or hard of hearing.

To assist audiologists in advising their clients appropriately, a careful needs assessment and selection process should be followed. This process should include audiological assessment as well as a methodical task analysis of the individual's receptive communication needs. Such a process has been used in Gallaudet's Audiology Clinic since 1985. This project will integrate the most current questionnaire into an interactive software package that can be used by audiologists to assess an individual's receptive communication needs, select appropriate hearing technology, and determine what training may be necessary to meet the client's communication needs.

The output of the program will consist of a comprehensive profile of audiological data, communication needs, training goals, and technology recommendations that will help audiologists address the communication needs of their clients more efficiently and effectively.

Computer Assisted Speech PERception Evaluation and Training (CASPER)

CASPER is a set of audio/video speech assessment and training materials. It was originally developed at the City University of New York (Boothroyd, 1987) for studies of aural rehabilitation in adult recipients of multi-channel cochlear implants. The goals were:
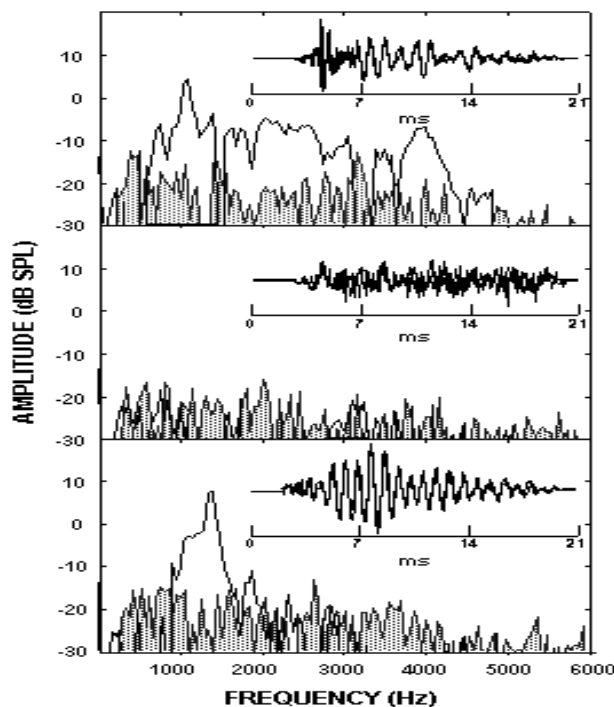
* control and consistency of listening activities and talker characteristics,
* a continuum of tasks from phonetic contrast perception, through phoneme and word recognition, to the perception of sentences and continuous narrative,
* audio, visual, and audio-visual presentation under computer control with automatic logging of performance

These materials will provide the field with a rich source of speech perception materials for use as assessment tools, practice materials and outcome measures.

Evaluation of the Tracking Technique

The tracking technique is widely used for both training and evaluation of communication skills of people with hearing loss. The technique involves interactive communication between the participant and the tester/trainer – a key characteristic of real-life communication that is absent from the vast majority of tests in audiology. A major problem with the tracking technique, however, is the high variability of the technique, due largely to inter-speaker differences and how the participant responds to this source of variability.

The RERC-HE will develop computer-based methods of tracking for training and evaluation that maintain the inherent interactive nature of the communication process while bringing the major sources of variability under control. Video materials are being prepared that will present stories in audio-visual format; thus the materials will support speechreading as well as auditory perception of speech. This tool will provide the field with an important intervention tool for people with acquired hearing loss who are using hearing aids or cochlear implants.

Peer Mentoring Certification Program Development

This project will train hard of hearing or deaf lay persons to help others adapt to hearing loss by giving them the needed skills, materials and support. The RERC will design, develop, initiate and evaluate the peer training program which will include 1) a 1½ year distance learning 13-credit curriculum leading to a peer mentor certificate based at Gallaudet University and 2) detailed course curriculum and training materials for each of the six courses to be included in the curriculum. The expected outcome of this project will be a cadre of peer mentors who will be made available to provide aural rehabilitation services under the guidance and supervision of audiologists. This innovative approach to service delivery will enable audiologists to provide much-needed aural rehabilitation services more efficiently and effectively in the competitive medical care marketplace.

Training and Dissemination

In addition to its research and development mission, the RERC-HE devotes a good deal of its resources to training and dissemination activities. In addition to training future researchers through a program of mentorship of doctoral students, the RERC-HE conducts a specialized consumer training project in collaboration with Self Help for Hard of Hearing People, Inc. and its new national program, the National Information and Training Center for Hearing Assistive Technology. The goal of this program is to train a minimum of forty consumers to be knowledgeable about the full range of hearing technology and how to increase its utilization in their state and local geographic area. This is accomplished by means of annual 3-day training sessions held in different areas of the country. Training participants put their learning to work by conducting training activities in their local areas, thus spreading the word to larger and larger audiences about the benefits of hearing technologies.

References
1. Haggard, M.P., Foster, J.R., & Iredale, F.E. (1981). Use and benefit of postaural aids in sensory hearing loss. *Scandinavian Audiology*, *10*, 45-52.
2. Oja, G.L. & Schow, R.L. (1984). Hearing aid evaluation based on measures of benefit, use and satisfaction. *Ear and Hearing*, 5: 77-86.
3. Punch, J.L., Robb, R, & Shovels, A.(1994). Aided listener preferences in laboratory versus real-world environments. *Ear and Hearing*, *15*: 50-61.
4. Stone, A.A., & Shiffman, S. (1994). Ecological Momentary Assessment in Behavioral Medicine. *Annals of Behavioral Medicine*, *16*: 199-202.
5. Grover B.C., & Martin M.C. (1979). Physical and subjective correlates of earmould occlusion. *Audiology*, *18*(4), 335-50.
6. Kuk, F.K. (1994). Maximum usable real-ear insertion gain with ten earmold designs. *Journal of the American Academy of Audiology*, *5*(1), 44-51.
7. Barac-Cikoja, D., Tamaki, C., O'Brien, M., McIntosh, N. (2001). Effects of spectrally and temporally altered feedback on the speech of hard of hearing persons. *The Journal of the Acoustical Society of America*, *109*, 2501.
8. Stone, M.A., Moore, B,C. (2002). Tolerable hearing aid delays. II. Estimation of limits imposed during speech production. *Ear and Hearing*, *23*(4):325-38.
9. American National Standards Institute (2001). American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids. (ANSI/IEEE C63.19-2001). New York: ANSI.
10. American National Standards Institute (2002). Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools. (ANSI S12.60-2002)
11. Finitzo-Hieber T, Tillman T.W.. (1978). Room acoustics effects on monosyllabic word discrimination ability for normal and hearing-impaired children. J Speech Hear Res., 21(3):440-58.
12. Yacullo W.S., Hawkins D.B. (1987). Speech recognition in noise and reverberation by school-age children. *Audiology*, *26*(4):235-46.
13. Johnson C.E. (2000). Children's phoneme identification in reverberation and noise. *Journal of Speech-Language-Hearing Research*, 43(1):144-57.
14. Boothroyd, A. *www.arthurboothroyd.com*
15. Kemp, D.T. (1978). Stimulated acoustic emissions from within the

human auditory system. *Journal of the Acoustical Society of America.* *64*: 1386-1391.

16. Hanson, H.M. and K.N. Stevens (2002). A quasiarticulatory approach to controlling acoustic source parameters in a Klatt-type formant synthesizer using Hlsyn. *Journal of the Acoustical Society of America*, *112*, 1158-82.

Literacy for Latino Deaf Students: A Socio-Cultural Approach

Barbara Gerner de García*

Some educators of deaf students may assume that because their Latino students cannot hear there is no need to worry about the complexity for these students of trying to learn English, ASL, and various aspects of American culture in school while continuing to be exposed to an additional language and culture at home. In

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reality, it is hard to imagine more complex socio-cultural situations than those confronting these children at home and at school.

Latino students, who make up almost 23% of the school-age deaf and hard of hearing population in the United States[1], are an extremely diverse group. Many are from immigrant families and, in fact, may be immigrants themselves. With Spanish as a common language, the 10,000 or more Latino families who have deaf children are diverse in country of origin, socioeconomic status, level of education, and length of time spent in the U.S.[2] The deaf children of these Spanish-speaking families exist in trilingual (ASL, Spanish, and English) or multilingual (ASL, another form of sign, Spanish, and English) worlds.

Many challenges exist for Latino families and their deaf children. As they immigrate to the U.S., the parents are often compelled to learn two new languages: English, for getting and keeping a job, and ASL, to communicate with their children who are learning ASL at school - even as they attempt to maintain their own language and culture of origin. The culture of the Latino home differs greatly from that of mainstream American culture, and also varies according to the family's country of origin. The cultures of Spanish-speaking families may therefore differ greatly from each other. American schools for deaf students are generally ill-prepared to work with such culturally and linguistically diverse students and families, and in spite of the increases in numbers of such

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students, often do not have staff with the cultural and linguistic skills needed to work effectively with Latino families[3,4].

The project Literacy for Latino Deaf and Hard of Hearing English Language Learners: Building the Knowledge Base is a research project funded by the U.S. Department of Education, through the Office of Special Education Programs and the Office of English Language Acquisition (formerly the Office of Bilingual Education and Minority Language Affairs). The goal of the project has been to create a scientific review of relevant research literature in deafness, special education, and the education of hearing English Language Learners, as well as Latino children and their families.

Educational researchers have long been aware that a majority of deaf students in the U.S. do not achieve high levels of English literacy, and Latino deaf and hard of hearing students achieve at lower levels than their American deaf and hard of hearing peers. Studies over a period of 20 years have also found that the achievement of Latino deaf children is lower than that of both their Anglo and African American deaf peers[5,6,7]. Educators may believe that the "problem" lies in the family's different language and culture. This study, however, avoids a negative or deficit view of Latino deaf and hard of hearing children. Instead, the review's conceptual framework uses a socio-cultural perspective on literacy development. This framework considers that the language and literacy development of Latino deaf and hard of hearing children are inevitably quite complex and take place within, and are highly influenced by, several levels of social interaction:

- The deaf child and his/her primary caretaker(s) and siblings
- The family and other members of the Latino culture and community
- The family and members of the deaf community
- The family and educators of the deaf
- The family and members of mainstream U.S. culture

There are a number of challenges in doing a review of the research on Latino deaf and hard of hearing children. We found that most empirical research on deaf and hard of hearing children tends to focus on children who are from White, middle class families. Our investigation of literature from the past 30 years identified 118 documents, including articles, chapters, dissertations, unpublished papers, and master's theses, about or including observations of Latino deaf and hard of hearing children. Of this collection, only 19 empirical research articles (excluding dissertations, theses, and duplicate publications), focused on Latino deaf children; and only 9 of these were published after 1990. In other words, the research literature that focuses exclusively on children who are deaf or hard of hearing and Latino is extremely scarce.

To understand the issues facing Latino deaf and hard of hearing students acquiring English literacy, it was necessary to consider research on reading and signing among deaf children in general. This is a huge task, as the research on reading and deafness provides no coherent picture of what is most effective[8]. However, several critical principles can be gleaned from the research we examined, the first of which is that language learned through interaction with others is the foundation of literacy. In other words, a deaf child is significantly more likely to become proficient at reading and writing if a sufficient interactive language base is established at an early age. Erting[9] argues that language interactions are crucial for building literacy and that deaf children must therefore engage in sustained, visually accessible, interactive discourse with adults able to communicate fluently in such language productions. Deaf children cannot learn a first language through print alone because text is not interactive[10]. They have tremendous difficulties learning to read English, because children generally have trouble learning to read a language they do not already know through audition[11], but if they have become fluent in a visually comprehensible language (such as ASL), this language can be used to learn about and eventually grasp written English[12].

The next critical principle is that the development of a first language would ideally occur as early as possible. The first six months of life constitute a critical period for language development. Deaf children who are identified and who receive intervention that includes sign language use before six months of age develop language skills comparable to (though slightly lower than) their hearing age peers[13]. This is becoming more readily possible with the widening use of Universal Newborn Hearing Screening (UNHS) programs.

Early intervention with early language development makes a significant difference even for children from families that have limited involvement in the intervention[14]. In other words, some families, particularly families with lower incomes and fewer resources, may have

difficulty participating as fully in early intervention programs with their young children as families with more resources (transportation, job flexibility, command of English, child care), but their deaf children benefit significantly when they receive very early language intervention services.

The next area of significance for the development of English literacy is language and literacy in the home. Spanish-speaking families with deaf and hard of hearing children may use multiple languages in the home, including spoken and written English and Spanish, as well as signed languages, including ASL, foreign signed languages, and home signs[15, 16, 17]. Home signs used within families can serve as a foundation for later language learning[18, 19].

There may be multiple generations in the home, with grandparents who are monolingual in Spanish, and hearing siblings who are trilingual in English, Spanish and ASL. The deaf or hard of hearing family member may use a variety of means to communicate with hearing family members including code-switching between ASL and a foreign sign language[20], writing in Spanish[21] and using spoken Spanish[22]. Additionally, some Latino parents have successfully participated in Shared Reading Projects and are motivated to learn how to read with their deaf children[23].

Hearing family members and their deaf and hard of hearing children all reap benefits when sign language is used in the home. However, many hearing parents find it difficult to learn to sign. Latino parents face language, cultural, and socioeconomic barriers, but they have been shown to benefit from sign language instruction designed to meet their unique needs[24, 25]. Programs that offer instruction in Spanish, use Spanish language materials, meet at times and in places that are convenient, or use innovative methods such as cable television, have more success.

One way to counter a deficit view of Latino families is to consider family strengths. A common misconception of Latino families who have a deaf child or a child with another disability, is that they are ashamed of their child and do not seek professional help. On the contrary, there is a growing body of research that suggests that Latino parents actively seek help in their efforts to raise a deaf or hard of hearing child[26]. A series of recent studies on Puerto Rican and Mexican American parents of children with disabilities[27, 28, 29] show that many Latino parents simultaneously seek professional help and support from religious and traditional beliefs. Their religious beliefs may provide a positive way to interpret disability, or alternatively the pursuit of traditional or alternative paths may serve to please grandparents and other relatives[30, 31, 32].

An area that has been found to be critical to the success of the deaf student is collaboration between home

and school. While schools often state that parents are a child's first and most important teacher, there is a large body of research that indicates schools are not adequately involving Latino parents. This is particularly true in schools for the deaf, which often lack staff with the linguistic and cultural skills to make parent participation a reality. The research also indicates that schools define parental involvement in ways that do not match Latino parents' ways of supporting learning at home[33, 34, 35]. Harry, & Kalyunpur, and Day[33] describe American special education policy as having a cultural base that may be alienating to culturally diverse parents. Because cultural differences run deeper than many educators understand, parent-school interactions become the site of cultural misunderstanding. Parents who do not fit the school-pre-scribed Individuals with Disabilities Education Act (IDEA)-encoded patterns of parental involvement earn the labels of "uninvolved" and even "uncaring". Not only do many forms of parental involvement and support for their children's education remain invisible, parents' efforts to have input in areas traditionally considered not their concern, such as curriculum, are thwarted[36].

The final area of challenge is classroom instruction. Latino deaf students may be "latecomers," starting their formal education later than their deaf peers. Some are immigrants and have little or no formal schooling before coming to the U.S. or they may be Spanish-dominant and need a trilingual approach in order to succeed. While Latino deaf and hard of hearing students have many of the same needs as their deaf and hard of hearing peers, they also are likely to need extra support from English as a Second Language (ESL) programs, to learn English, in addition to ASL, in order to satisfactorily participate in the instructional programs offered in the classroom.

This review of the research suggests some possible solutions, as well as some needs, in the field of education. Early identification and intervention that is accessible and culturally sensitive is critically important for all deaf and hard of hearing children, regardless of cultural background. Latino parents can benefit from parent education programs and sign language classes that are linguistically and culturally compatible and support the equally important need for an emphasis on learning English. Culturally sensitive parent training programs that focus on the acquisition of literacy for their deaf children and provide practical strategies for parents are key. There is a critical need not only to recruit and support more culturally and linguistically diverse professionals in the field of deaf education, but also to provide training to help teachers develop culturally relevant practices. Finally, there is a need for more researchers in the field of deaf education who have the linguistic and cultural knowledge required to investigate the needs of Latino deaf students and their families.
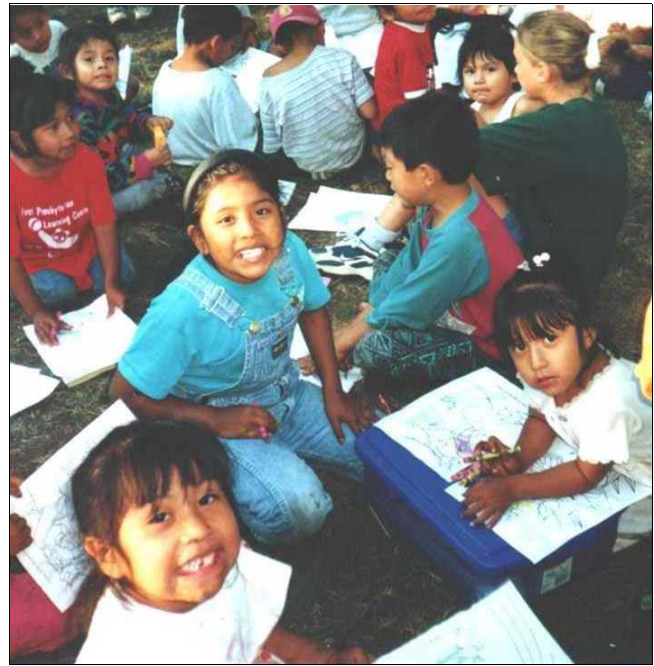
References

1, 2. Gallaudet Research Institute (January, 2003). *Regional and National Summary Report of Data from the 2001-2002 Annual Survey of Deaf and Hard of Hearing Children & Youth*. Washington, DC: GRI, Gallaudet University.

3. Gerner de García, B.A. (2000). Meeting the needs of Hispanic/Latino deaf students. In K. M. Christensen (Ed.), *Deaf Plus: A Multicultural Perspective* (pp.149-198). San Diego: Dawn Sign Press.

4. Ramsey, C.L. (2000). On the border: cultures, families, and schooling in a transnational region. In K. Christensen (Ed.), *Deaf Plus: A Multicultural Perspective* (pp. 121-147). San Diego: Dawn Sign Press.

5. Allen, T.A. (1986). Patterns of academic achievement among hearing impaired students: 1974 and 1983. In A.N. Schildroth and M.A. Karchmer (Eds.), *Deaf Children in America* (pp. 161-206). San Diego: College Hill Press.

6. Jensema, C. (1975). The relationship between academic achievement and the demographic characteristics of hearing impaired youth. Office of Demographic Studies. Washington, DC: Gallaudet College.

7. Kluwin, T. N. (1994). The interaction of race, gender, and social class effects in the education of deaf students. *The American Annals of the Deaf*, *139*(5), 465-471.

8. Waters, G.S. & Doehring, D.G. (1990). Reading acquisition in congenitally deaf children who communicate orally: Insights from an analysis of component reading, language, and memory skills. In T. Carr & B. Levy (Eds.) *Reading and Its Development: Component Skills Approaches*, pp. 323-373. New York: Academic Press.

9. Erting, C. (2003) Language and literacy development in deaf children: Implications of a socio-cultural perspective. In B. Bodner-Johnson and M. Sass-Lehrer (Eds.) *The Young Deaf or Hard of Hearing Child: A Family-Centered Approach to Early Education*. pp. 373-398. Baltimore: Brookes.

10. Goldin-Meadow, S. & Mayberry, R.I. (2001). How do profoundly deaf children learn to read? *Learning Disabilities Research & Practice*, *16*(4), 223-229.

11. Wilbur, R.B. (2000). The use of ASL to support the development of English and literacy. *Journal of Deaf Studies and Deaf Education*, 5(1), 81-104.

12. Johnson, R.E., Liddell, S.K. & Erting, C.J. (1989). Unlocking the curriculum: Principles for achieving access in deaf education. Working Paper 89-3. Washington, DC: Gallaudet Research Institute.

13. Yoshinaga-Itano, C. (2003) From screening to early identification and intervention: Discovering predictors to successful outcomes for

children with significant hearing loss. *Journal of Deaf Studies and Deaf Education*, 8(1), 11-30.

14. Moeller, M.P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics*,*106*, E43.

15. Lerman, A. (1984). Survey of Hispanic hearing impaired students and their families in New York City. In G. Delgado (Ed.) The Hispanic Deaf: Issues and Challenges for Bilingual Special Education. Washington, DC: Gallaudet College Press.

16, 20. Gerner de García, B.A. (1993). *Language Use in Spanish-Speaking Families with Deaf Children*. Dissertation Abstracts International, 53, 12. (University Microfilms No. GAX93-17684).

17, 22. Gerner de García, B.A. (1995). Communication and language use in Spanish-speaking families with deaf children. In C. Lucas (Ed.), *Sociolinguistics in Deaf Communities* (Vol. I., pp. 221-252). Washington, DC: Gallaudet Press.

18. Emmorey, K.,Grant, R., & Ewan, B. (1994). A new case of linguistic isolation: Preliminary report. Paper presented at the Boston University Conference on Language Development. Boston, MA.

19. Morford, J. (2002) The expression of motion events in homesign. *Sign Language and Linguistics*, *5*(1), 56-71.

20. See reference 16.

21. Albertini, J. & Shannon, N. (1996). Kitchen notes, "the grapevine," and other writing in childhood. *Journal of Deaf Studies and Deaf Education*, *1*(1), 64-74.

22. See reference 17.

23. Delk, L. & Weidekamp, L. (2001). Shared reading project: Evaluating implementation processes and family outcomes. Washington, DC: Laurent Clerc National Deaf Education Center.

24. Allen, B.M. (2002). ASL-English bilingual classroom: The families' perspectives. *Bilingual Research Journal*, *26*(1), 1-20.

25. Christensen, K. (1986). Conceptual sign language acquisition by Spanish-speaking parents of hearing-impaired children. *American Annals of the Deaf*, *131*(4), 285-87.

26. Mapp, I. & Hudson, R. (1997). Stress and coping among African American and Hispanic parents of deaf children. *American Annals of the Deaf*, *142*(1), 48-56.

27. Reyes-Blanes, M., Correa, V., & Bailey, D., (1999) Perceived Needs of and Support for Puerto Rican Mothers of Young Children with Disabilities. *Topics in Early Childhood Special Education*. *19*(1),54-63.

28, 31. Skinner, D., Bailey, D. B., Jr., Correa, V., & Rodriguez, P. (1999). Narrating self and disability: Latino mothers' construction of identities vis-a-vis their child with special needs. *Exceptional Children*, *65*(4), 481-495.

29, 32. Skinner, D., Correa, V., Skinner, M., & Bailey, D. B. (2001). Role of religion in the lives of Latino families of young children with developmental delays. *American Journal on Mental Retardation*, *106*(4), 297-313.

30. Steinburg, A., Bain, L., Li, Y., Montoya,L., & Ruperto, V. (2002). A look at the decisions Hispanic families make after the diagnosis of deafness. Retrieved May 6, 2003, from Laurent Clerc National Deaf Education Center website: http://clerccenter2.gallaudet.edu/KidsWorldDeafNet/e-docs/HispFam

31. See reference 28.

32. See reference 29.

33. Harry, B., Kalyanpur, M., & Day, M. (1999). *Building Cultural Reciprocity with Families: Case Studies in Special Education.* Baltimore: Brookes.

34. Kluwin, T. & Corbett, C.A. (1998). Parent characteristics and educational program involvement. *American Annals of the Deaf*, *143*(5), 425-31.

35. Lopez, G.R. (2001). The value of hard work: Lessons on parent involvement from an (im) migrant household. *Harvard Educational Review*. *71*(3), 416-437.

36. Bennett, A. (1988). Gateways to powerlessness: Incorporating Hispanic deaf children and families into formal schooling. *Disability, Handicap & Society*, *3*(2), 119-151.

In the Spotlight:

Visiting Researcher Studying Automated Recognition of ASL

Christian Vogler

Since fall of 2003, Dr. Christian Vogler has been working as a Visiting Research Scientist in the GRI exploring the feasibility of sign language recognition technology. Dr. Vogler was born and raised in Hamburg, Germany. He became fascinated with computers at a young age and eventually majored in computer science at the University of Hamburg where he also pursued a minor in sign language linguistics. After completing his undergraduate studies, he transferred to the University of Pennsylvania, where he began to combine his interests by doing research on a framework for automated recognition of ASL. He obtained his Ph.D. in computer science in 2002, worked briefly as a post-doctoral fellow at Rutgers University, then began his current work at the GRI.

Automated sign language recognition technology is similar to speech recognition, or speech-to-text systems, but ASL recognition is much harder than speech recognition because of the modeling and computational complexity of the task. Often multiple things happen at the same time during the execution of a sign. For instance, both the left and the right hand of the signer can move simultaneously, or the hand shape can change as the hand moves from one location to another. In contrast, speech recognition has generally been able to represent speech in written words as the words are recognized in a straight-forward, linear sequence of sounds.

Most of Dr. Vogler's work focuses on developing appropriate algorithms for automatic recognition of signs. This work combines linguistic knowledge of ASL phonology and computer science work, focusing on statistical recognition algorithms.

At the GRI, Dr. Vogler has been examining face tracking for the purposes of facial expression recognition. This aspect of sign language recognition has proved especially complex and Vogler has been working on it both individually and in collaboration with Dr. Dimitris Metaxas of Rutgers University (his former thesis advisor) and Dr. Siome Goldenstein of UNICAMP, Brazil. Since much of the grammar in sign languages, such as negation and question markers, is expressed through the signer's face, facial expression recognition forms an important component of ASL recognition systems.

Before it is possible to run facial recognition algorithms, however, it is necessary for the computer to recognize where in a video image the face is ("tracking"), its posture, and what the various parts are doing (such as

eyebrow raising, mouth movements, etc). Although this task is easy for humans, it poses extremely difficult problems to computers. Vogler and his collaborators use a 3D deformable model approach to track the face from video. The tracking results in a parameter vector describing with a small set of numbers the orientation and position of the face, as well as various facial deformations, such as eyebrow raising, jaw opening, lip curving, and so on.

Although Vogler says that he and his collaborators are still far from developing a recognition system that works well enough for everyday use, they are now able in laboratory situations to test and refine recognition methods with native signers producing natural ASL sentences. This groundbreaking work must proceed, he says, in order for everyday practical applications ever to be realized.

Mental Health Services for Deaf People: A Resource Directory, 2003 Edition

The 2003 revised edition of *Mental Health Services for Deaf People: A Resource Directory* is now being widely used by mental health professionals and deaf consumers as a source of referral information. It contains a descriptive listing of over 150 programs that provide mental health services to deaf individuals across the United States and Canada.

The provision of appropriate mental health services to deaf people has always posed a challenge to the mental health and deafness field. Problems encountered have included frequent difficulties in identifying service providers who are not only professionally trained in the mental health fields, but who are also knowledgeable regarding the unique cultural and language-related considerations of deafness. The developers of this volume, Dr. Diane Morton and Ms. Caroline Kendall of Gallaudet

University's Department of Counseling, believe that a national directory of mental health professionals who serve deaf clients represents a significant step toward improved accessibility and accountability in this special field.

Since the information presented in this directory was self-reported by the agencies or individuals represented, the authors cannot assume responsibility for the accuracy or currency of the reported information. Inclusion in the directory, in other words, does not constitute an endorsement of any agency or service provider by the authors or by Gallaudet University. Consumers should make sure the agency or service provider is licensed or certified for the provision of such services. Consumers are also advised to seek additional references and information from individuals or groups in their area to substantiate the quality and accessibility of the services provided.

Mental Health Services for Deaf People: A Resource Directory, 2003 Edition is available for $14.95 per copy plus postage and handling from the Gallaudet Research Institute at Gallaudet University. To order, print this page, then detach and send the completed order form along with a check or money order payable to Gallaudet University.

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Liddell, S.K. (2003). *Grammar, Gesture, and Meaning in American Sign Language.* Cambridge: Cambridge University Press.

Lucas, C. (Ed.) (2003). *Sociolinguistics in Deaf Communities: Language and the Law in Deaf Communities* (Volume 9). Washington, DC: Gallaudet University Press.

Lucas, C., Bayley, R., & Valli, C. (2003). *What's Your Sign for Pizza? An Introduction to Variation in ASL.* Washington, DC: Gallaudet University Press.

Marschark, M., & Spencer, P. (Eds.) (2003). *Oxford Handbook of Deaf Studies, Language, and Education.* London and New York: Oxford University Press.

Meadow-Orlans, K., Mertens, D., & Sass-Lehrer, M. (2003). *Parents and Their Deaf Children: The Early Years.* Washington, DC: Gallaudet University Press.

Mertens, D.M., & McLaughlin, J. (2004). *Research and Evaluation Methods in Special Education.* Thousand Oaks, CA: Corwin Press.

Morton, D.D., & Kendall, C.J. (2003). *Mental Health Services for Deaf People: A Resource Directory, 2003 Edition.* Washington, DC: Gallaudet Research Institute and Gallaudet University Department of Counseling. (See ad on page 11).

Oliva, G. (2004). *Alone in the Mainstream: A Deaf Woman Remembers Public School.* Washington, DC: Gallaudet University Press.

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