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Center for Research, Teaching and Learning · National Technical Institute for the Deaf · Rochester Institute of Technology

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Michael Stinson is a professor in the Department of Research at NTID.

C-Print Update: Recent Research and New Technology

by Lisa B. Elliot and Michael S. Stinson

C-Print™ refers to a family of computer-assisted, speech-to-print technologies. Here, we briefly describe the service and review recent findings and forthcoming enhancements to the system. Since 1990, approximately 1000 deaf and hard-of-hearing students have been supported in educational environments through use of C-Print and over 500 individuals from approximately 350 educational programs in at least 46 states and 4 foreign countries have completed the month-long training to become a C-Print captionist. C-Print has been widely disseminated beyond NTID and is now frequently requested by deaf and hard-of-hearing students around the world. For a background in the C-Print system, see articles in the *NTID Research Bulletin*, *1*(3), Fall 1996, and *5*(2), Spring 2000.

Background

C-Print includes both automatic speech recognition (ASR) and computerized word-abbreviation approaches to transcribe speech into text. New software developed by the project provides communication between computers and provides displays for the captionists and students. C-Print does not produce verbatim text but uses summary techniques to capture as much of the meaning as possible. It was developed after many years of research at NTID with another speech-to-text system, called Communication Access Real-time Translation (CART), that uses stenographic equipment to produce verbatim text. Students were happy with the CART text, but researchers realized that for many school districts, the expenses associated with the system were much too great.

Research with College Students: 1993-1996

The first large-scale study using C-Print ran from 1993-1996 on the campus of RIT (Elliot, Stinson, McKee, Everhart, & Francis, 2001). Over this three-year period, 36 deaf and hard-of-hearing students who were mainstreamed into 32 business and liberal arts classes, and who also were supported by interpreting and notetaking, used the C-Print support service. These students participated in questionnaire and interview studies in which they provided feedback about the support service. Twenty-two of the 36 students were also interviewed.

Questionnaire items included student ratings of lecture comprehension. These ratings indicated good comprehension with C-Print, and the mean rating was significantly higher than that for understanding of the interpreter. Students also rated the hard copy printout provided by C-Print as helpful, and they reported that they used these notes more frequently than the handwritten notes from a paid student notetaker. Interview results were consistent with those for the questionnaire.

Questionnaire and interview responses regarding use of C-Print as the only support service indicated that this arrangement would be acceptable to many students, but not to others. Data from school records were also correlated with students' questionnaire responses, and communication characteristics were related to responses to the questionnaire. Students who were relatively

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Notes of Note

On January 24, 2003, **Susan Fischer** presented a colloquium related to her cross-linguistic sign language research to the linguistics department of the University of Toronto. For more information she can be contacted at *SDFNCR@RIT.EDU*.

Oxford University Press has just published the *Oxford Handbook of Deaf Studies, Language, and Education*, edited by **Marc Marschark** and **Patricia Spencer** (Gallaudet University). In describing the volume, RIT Vice President for NTID, Robert Davila said, "In my opinion, over the course of the past 40 years, no other deaf studies publication offers a more comprehensive and authoritative perspective of the social, psychological, linguistic, and pragmatic aspects of deafness." The 672-page handbook contains 36 chapters, including chapters by **John Albertini** and **Sara Schley**, **Harry Lang**, **Michael**

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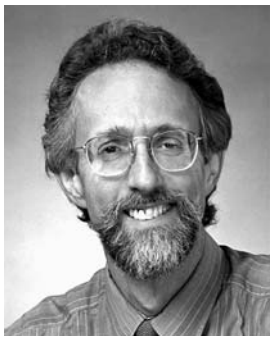

Accommodation and Access

"Will I have an interpreter for this class?"
"Will the boss be accommodating?"

Such questions run through the minds of deaf and hard-of-hearing students and employees daily. Sign language interpreters, note takers, and newer support services, such as C-Print captionists, are accommodations that provide students and employees access to lecture, presentation, and discussion. At school and in the workplace, it is often up to the deaf or hard-of-hearing person to request accommodation or changes that will improve access to information and communication. According to the *Oxford English Dictionary (Third Edition)*, to accommodate means to reconcile persons who differ and to bring persons who differ to harmony or agreement. Where differences become barriers, reconciliation will open the way to communication and information.

Though serious disagreements continue over what constitutes "reasonable accommodation" and how to achieve it, we are certain of two things. We know that new speech-to-print technologies can improve students' access to classroom discourse and that legislation (for example, the Americans with Disabilities Act, 1990) can only promise due process. Accommodating peoples' differences and providing equivalent access to all learners and employees are complex processes, and we are fortunate to have two research reports in this issue of the *NTID Research Bulletin* that shed light on them.

The first report by Lisa Elliot and Michael Stinson (NTID Department of Research) brings us up-to-date on the use of new speech-to-print technologies in mainstream high school and college classrooms. The C-Print program of research has spawned software and hardware development, training, and prototype evaluation. The goal of the program has always been to develop sound new technologies that will improve access and enhance learning in the classroom. For balance and focus on the workplace, we invited our colleague David Baldridge (College of Business, RIT) to summarize what he found to be the key personal and contextual variables leading an employee to request or not to request changes in the workplace. Twelve years after the Americans with Disabilities Act was signed into law, employees still hesitate to request accommodation.

Future issues of the Bulletin will report on other studies of access and accommodation, a main focus of activity in the Department of Research at NTID. As always we hope you find these reports thought-provoking and helpful and that you will send us your comments and suggestions via the NTID Research Advisory Group's website at *http://www.rit.edu/490www/RAG*. Also, please check out the Department of Research's new website at *http://www.rit.edu/ntidresearch*.

John A Albertini

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Chair, Department of Research

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Lisa Elliot is a research associate in the Department of Research at NTID. Since 1996, she has been involved with the research and development of speech-to-text captioning systems at NTID. Currently, her other research interests include student study skills and applications of universal design in teacher education. For more information, she can be reached at LBENRD@RIT.EDU.

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proficient in reading and writing English, and in speechreading, responded more favorably to C-Print.

Research with High School and College Students: 1996-1999

With support from the U.S. Dept of Education, we were able to expand our research to three college and university settings in the Rochester, NY, area, and to public high schools in greater metropolitan Rochester, and in Irvine and San Diego, CA. Two additional interview (and questionnaire) studies and a controlled experiment have been conducted.

Successful implementation of assistive technology can satisfy both the needs of the student and the values of the educator when everyone's needs and values are taken into account.

Interview studies. Interviews were conducted with 75 participants (25 high school students, 14 college students, 14 high school classroom teachers, 10 high school teachers of the deaf, and 12 college professors) about their experiences with the C-Print system.

One study focused on students' and teachers' use of C-Print notes (Elliot, Foster, & Stinson, 2002). Consistent with research on normally hearing students, high school students in this study typically would read the notes only, while college students used multiple study strategies with the notes. Teachers tended not to know how their students used their notes for studying and they were sometimes reluctant to teach students about effective note usage. This study supports the idea that both students and teachers could benefit from further instruction on note usage and study skills.

In another study, we analyzed teachers' acceptance of C-Print as a support service in their classrooms. Previous research has found that student success using an assistive technology may be, in part, attributed to educators' acceptance of the technology. Using Rogers (1995) model of "diffusion of innovations," we found that educators accepted C-Print due to its relative advantage over other notetaking services, that is, the perceived simplicity of the system and its perceived potential for students. However, some educators, who prefer eye contact with their students as an indication that students are participating in class, were resistant to C-Print because the technology requires students to focus their attention on a computer. We also learned that educators who were more accepting of the service had different perceptions of their initial introduction to the service; they recalled being asked to participate in trials of C-Print in their classrooms, whereas less accepting teachers perceived that they were "told" a student would be trying C-Print. Successful implementation of assistive technology can satisfy both the needs of the student and the values of the educator when everyone's needs and values are taken into account.

Experiments. Data are currently being analyzed for two controlled experiments. In one experiment, participants were 48 deaf and hard-of-hearing high school students, mostly from San Diego. Students were randomly assigned to one of three experimental conditions. In Condition 1, students viewed a brief (15 minute) videotaped lecture about Japanese-American history. At the same time, on a different television screen, they watched either C-Print captioning of the lecture or a videotape of an interpreter. After the videos concluded, students took two brief quizzes—a recall test (fill-in-the blank) and a recognition test (multiple choice).

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Stinson, and Marc Marschark. For additional information about this publication, contact Marschark at *MEMRTL@RIT.EDU*.

In November, Marc Marschark was invited by the Taiwan Association for the Deaf and the Taiwan National Teachers College to present a series of lectures in Taiwan. The lectures served as keynote addresses for conferences in Taipei and Tainan on deaf education and will be published (in Mandarin) by the Taiwan Association for the Deaf.

Bob Whitehead and colleagues recently published an article, "Preservation of place and manner cues during simultaneous communication: A spectral moments perspective" (Kardach, J., Wincowski, R., Metz, D.E., Schiavetti, N., Whitehead, R., & Hillenbrand, J. (2002). *Journal of Communication Disorders*, *30*, 533-542). Spectral moments, which describe the distribution of frequencies in a spectrum, were used to investigate the preservation of acoustic

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Michael Stinson is leader of the team that has developed the C-Print speech-to-text system. He currently directs projects funded by the US Department of Education to incorporate automatic speech recognition into the C-Print system and to provide training in C-Print nationally. He is also a member of the faculty of the graduate program that prepares teachers of the deaf and has taught in the program in school psychology at RIT. Stinson has presented and published extensively on instruction of and social integration of deaf and hard-of-hearing students in general education classrooms, as well as on effects of technology, interpreting, notetaking, and tutoring. Stinson is deaf and he received all his education in mainstream classes. For more information, he can be reached at MSSERD@RIT.EDU.

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Students also completed demographic data including communication preference. The following week, students returned and watched another lecture, this time accompanied by either C-Print or an interpreter (whichever format they did not receive in session one).

…students do at least as well, and in some instances better, in retaining information with a C-Print presentation than with an interpreted one.

In Condition 2, students followed a similar protocol to Condition 1, except that before they received the quiz, students were given a copy of notes about the lecture to study. If students viewed the C-Print captioning, they then received the notes generated by C-Print. If the students viewed the video with the interpreter, they then received handwritten notes produced by a notetaker. After reviewing the notes for up to 20 minutes, students took the two quizzes.

In Condition 3, students attended the experiment for four separate sessions. In sessions one and three, students viewed the videos and received notes to study. In sessions two and four, students again reviewed the notes and then took the quizzes.

A key finding for the experiment with the high school students was that students retained significantly more information from the C-Print presentation than from the interpreted one. This result is consistent with that of the questionnaire study, because it indicated that students do at least as well, and in some instances better, in retaining information with a C-Print presentation than with an interpreted one. For both the C-Print and interpreted presentations, students remembered more information in Condition 3, in which there was a delayed test and additional time to study the notes, than in Condition 1 (no notes) or Condition 2 (notes and immediate test), suggesting that the combination of notes, the opportunity of additional time to review them, and the delay in testing facilitated performance.

The second experiment involved the participation of 48 deaf and hard-of-hearing college students at RIT. This experiment followed the same format as the high school experiment, but used different videotapes. The college videos were excerpts from actual sociology lectures given by a professor at RIT. Results for this experiment were more complicated than those for the first experiment. For Condition 1, in which students were required to remember specific terms without the benefit of reviewing notes or printed material, students recalled more information with C-Print than with an interpreter. In particular, for the C-Print presentation, students did not do significantly better in Conditions 2 and 3 when they had C-Print text for study after viewing the real-time display than when they did not. However, for the interpreted presentation, students did better when they had notes from a notetaker than when they did not.

One interpretation of these results is that, for the C-Print presentation, students retained enough information regarding specific terms, spelling, etc., that they did not need the text to resolve ambiguities. However, for the interpreted presentations there were such ambiguities, and consequently, the opportunity to review these notes helped to clarify uncertainties about specific terms in the lecture. These results need to be interpreted in the context of the finding that there were not overall differences in retention (both recall and recognition tests) for the interpreted and C-Print presentations (Stinson et al., 2000).

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cues, e.g., place and manner of articulation, to intelligibility of speech produced during simultaneous communication (SC) in relation to those acoustic cues produced when speaking alone. The spectral moments obtained from speech produced during SC were indistinguishable from those obtained during speech alone, indicating no measurable degradation of obstruent spectral acoustic cues during SC. For more information on this research, contact Whitehead at *RWWNCR@RIT.EDU*.

For the past two years, **Harry Lang** has been developing a website for the dissemination of information to promote learning by deaf and hard-of-hearing students. COMETS (the Clearinghouse On Mathematics, Engineering, Technology and Science) is a project funded by the National Science Foundation to enhance science, technology, engineering and mathematics education for deaf and hearing students. This website provides

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LaTonja Adams, C-Print captionist, and Kevin Barker.

Implications from the Research

Implications from the research conducted with C-Print to date has allowed us to fine tune and improve the system in many ways. For example, based on feedback from students and teachers, we are developing new training materials that will help students and their teachers get the most out of the C-Print experience. This will include workshops for teachers and parents, and printed and on-line instruction for effective software usage and study habits. Feedback we received from captionists has also resulted in physical changes to the C-Print software system and its implementation, which we will cover in the following section.

Looking Ahead to the Future of C-Print

C-Print user-interface software. In the past, captionists used three commercially available software programs running simultaneously—a word processing program, a typing abbreviation program, and a communications program that allows captionist and student computers to "talk" to one another. Based on feedback from captionists, we created an in-house software, called C-Print Pro©. C-Print Pro does everything that the three programs used to handle, only better! For example, in addition to allowing captionists to shorten their typing time with fewer keystrokes, students can also highlight their notes, make their own notes on the screen during class, and even type questions to the captionist without interfering with captioning.

Integrating ASR with C-Print allows captionists to continue captioning long after one hour…. Preliminary research suggests that using ASR, captionists capture about 83% of all idea units and are producing text that is 97% accurate.

In developing these features of the software, the C-Print team kept in mind the difficulty of deaf students simultaneously focusing on watching the teacher or real-time display and taking good notes. Project staff designed the highlighting and notetaking features so that students can use them with minimal diversion from attending to the teacher and/or the real-time text display.

Automatic speech recognition. One limitation of a typing-based system at the postsecondary level where classes are often longer than an hour is fatigue. Prolonged typing may lead to pain and injury. With ASR, captionists can utilize their voices instead of their hands. Integrating ASR with C-Print allows captionists to continue captioning long after one hour. Instead of typing, the captionist speaks into a microphone that is covered with a sound baffler—a dictation mask—that is connected to the computer (Stuckless, 2000). We chose to use an intermediary approach, which requires the presence of a captionist, because ASR technology is not yet sophisticated enough to capture nuances of speech, add punctuation, or detect multiple voices. Our intermediary captionist is able to insert this information into the text and make it readable for the student. Preliminary research suggests that using ASR, captionists capture about 83% of all idea units and are producing text that is 97% accurate (Elliot, Harradine, & Stinson, 2002).

Next steps for the project will be to implement ASR and the new software in high school and college classrooms, adjusting the system to make it even more effective. With both ASR and word-abbreviation approaches to producing text and the new C-Print Pro software, the system is more flexible. In addition, drawing on research and experience, the project will develop new materials that should better help students make the most out of their experience with C-Print.

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Workplace Accommodation: Is it Really Okay to Ask?

by David C. Baldridge

David Baldridge is an assistant professor in the RIT College of Business.

…the social environment not only influences personal assessments regarding the cost of asking for help, but also influences normative assessments about when help should or should not be sought.

Introduction

This study investigated situational attributes that influence employees' decisions to request, or not request, needed workplace accommodation due to perceived normative appropriateness—that is, *do others think I should ask?* Past studies (e.g., Florey, 1998; McLaughlin and Gray, 1998) have shown significant reluctance to request needed accommodations. Currently little is known about factors that influence the favorability of requesters' assessments and the likelihood of withholding a request based on perceived normative appropriateness, i.e., what situational characteristics will keep an employee from requesting needed workplace accommodation because s/he believes *others* think accommodation should not be requested?

Based on a review of the help-seeking and workplace-accommodation literatures, four requester attributes—age, sex, age of disability onset, and disability severity—and three workplace attributes—employer size, supervisor relationship quality and co-worker relationship quality—are hypothesized to influence the extent to which requests are withheld due to normative assessments. Survey data from 250 deaf or hard-of-hearing, full-time employees was used to test these hypotheses. Details of the study and full results are available from the author.

Theory

Given the paucity of research on the perceived normative appropriateness of requesting accommodation, literature from "help seeking" was used in conjunction with the literature on "workplace accommodation."

Normative appropriateness. In the accommodation literature, a distinction is drawn between individuals' personal assessment regarding an action or behavior and their normative assessments of what others think they should do. Both are predictors of intentions and accommodation-requesting behavior (Baldridge and Veiga, 2001). Gross and McMullen (1983) showed that the social environment not only influences personal assessments regarding *the cost* of asking for help, but also influences normative assessments about *when* help should or should not be sought.

Request attributes. Lee (1997) identified two individual attributes thought to influence the level of help seeking: sex and status differential. Women generally perceive greater normative support. In many cultures men are expected to be more self-reliant and independent. Individuals were less apt to make requests when they feared losing power, and Baldridge and Viega (2001) suggest greater risk of losing power when a request is more likely to reveal new, and perhaps unfavorable, information and when it will change others' perceptions of the requester. Men, younger workers with less severe losses and those who lost their hearing later in life are more likely to withhold requests for needed accommodation.

Request context. Requesters try to seek help from others who will be less burdened by providing assistance (Anderson and Williams, 1996). Baldridge and Viega (2001) suggest that overall relationship quality may influence a requester's assessments on normative appropriateness of requesting

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many resources, including informational pages and complete "workshops" on a variety of topics, which can be used individually by teachers, in pre-service teacher education courses as lessons, or as actual workshops for in-service professional development programs to help teachers interested in renewing certification. The COMETS website is at *http://www.rit.edu/~COMETS*. For more information, contact Lang at *HGL9008@RIT.EDU*.

Susan Foster (PI) and **Gary Long** (Co-PI) have recently receided funding from two programs at the US Department of Education for three year projects to promote access and inclusion for deaf and hard-of-hearing students in postsecondary education. The two awards, totaling over $1M, will allow the project team, including Rosemary Saur (Department of Science and Engineering Support at NTID) and faculty, staff and students from

David Baldridge is an assistant professor of Management in RIT's College of Business. He teaches courses in Organizational Behavior, Leadership and Organizational Change. His research interests include change managment, technology acceptance, inclusion of people with disabilities and family businesses. For more information, he can be contacted at DCBBBU@RIT.EDU.

accommodation. Thus, requesters in smaller organizations, with few resources, and with lower quality relationships with supervisors and co-workers are more likely to withhold requests for needed accommodation.

Methods

…the perceived normative appropriateness of requesting accommodation was more a function of general relationship quality than organization's resources.

The current study focuses on one disability group—people who are deaf or hard of hearing. Surveys regarding workplace accommodation were sent to 688 individuals; 250 usable surveys were returned (36.3 percent). No significant difference was found when comparing the age, sex, and educational level of those who completed the survey and those who did not. For the final sample, 53 percent of the respondents were women; the mean age was 40 with a range of 21 to 63 years. Existing measures were available for the same or similar constructs. Therefore, rather than develop entirely new measures, existing measures were modified and verified.

Discussion

As expected, both attributes of the *requester* and the *request context* were significantly related to the tendency to withhold requests. For example, younger employees were significantly more likely to report that they withheld requests due to perceived lack of normative appropriateness. In terms of request context, supervisor supportiveness was the most dominant factor and highly correlated with co-worker supportiveness. Together this suggests that the perceived normative appropriateness of requesting accommodation was more a function of general relationship quality than organization's resources. Moreover, a supportive relationship with one's supervisor may influence the extent of co-worker supportiveness. Only one study variable, sex, was shown to correlate with both supervisor and coworker supportiveness—women reported slightly higher quality relationships.

Just over half of the respondents reported that they had withheld a request for a needed accommodation at least once within the last year due to perceived lack of normative appropriateness. Roughly one quarter had done so within the last month. Yet, while withholding requests is common, the frequency is uneven and much less likely when supportive relationships are formed.

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the RIT College of Science and the Center for Professional Development, to identify and implement best teaching practices for deaf and hard-of-hearing students. The goals of the project are to 1) conduct a series of experiential workshops and individualized coaching activities, 2) use the workshops and individualized activities to identify challenges and best teaching practices, linking practice to the principles of Universal Design for Instruction, 3) package the materials and activities in a variety of portable formats designed to motivate and actively engage faculty at other postsecondary institutions, 4) field-test the products, 5) disseminate and deliver the products nationally, and 6) establish an administrative model that will enable core project functions to be maintained beyond the funding period, both at RIT and at other postsecondary institutions. For more information on the project, contact Foster at *SBFNIS@RIT.EDU*.

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LaTonya Adams, NTID C-Print captionist, captures the text of a lecture for Kevin Barker in an RIT course, Persuasion and Social Change (with Professor Diane Hope). See the article on p.1 for a discussion of the C-Print System.

Implications of NTID Research

for deaf and hard-of-hearing people • NTID Research Bulletin

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In 1993, the National Technical Institute for the Deaf established the Center for Research, Teaching and Learning. A primary mission of the Center is to "foster advances in teaching and learning that enhance the academic, professional, social and personal lives of people who are deaf or hard of hearing." Among its other functions, the Center both conducts research relevant to that goal and supports research conducted by colleagues from across NTID.

As part of our collaborative efforts, the Center regularly undertakes the collection and dissemination of relevant research findings from across NTID. Included for each publication is a description of the implications of the research findings the author thinks will be most relevant for NTID's audiences.

Berent, G.P., & Clymer, E.W. (2001). A Web-based initiative to infuse English across the curriculum for deaf and hard-of-hearing students. In *Papers from Instructional Technology and Education of the Deaf: Supporting Learners, K-College [On-line]. Available: http://www.rit.edu/~techsym.*

This project describes the "Supporting English Acquisition" (SEA) website (*http://www.rit.edu/~seawww*) and outlines a collaborative, Web-based effort to infuse English teaching principles and methods into technical, math, science, social science, and humanities courses taken by students at NTID. Because English remains a formidable challenge to most NTID students, the goal of this "English across the curriculum" effort is to provide teachers with online professional development that will enable and empower them to promote their students' English skill development within the naturalistic context of their course content.

Implications

Faculty's incorporation of English teaching principles and methods into content courses through the guidance of the SEA Web site should have a significant impact on both teaching and learning. Ultimately, the considerable increase in time devoted to English language practice—in naturalistic settings related to students' major subject areas—is expected to result in a significant improvement in students' English language skills.

Caccamise, F., & Lang, H.G. (2000). SIGNS for science and mathematics: A resource book for teachers and students, 2nd edition. Rochester, NY: National Technical Institute for the Deaf.

Skilled signers knowledgeable about science and mathematics were interviewed to collect the signs they use for terminology in these fields. These signs were then shared with other experts, who provided judgments of the general acceptability of the signs. This volume includes a selected reading list on science and mathematics education for students who are deaf, as well as commonly accepted signs for the sciences and mathematics.

Implications

Artificial versus natural sign language vocabulary development continues to be a major issue in academic settings. The results of the process used to document and select signs for inclusion in this book of technical terminology show that effective

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communication in academic environments can be supported through a systematic process for documenting and sharing signs used by skilled sign language communicators. Thus research efforts should focus on observing, documenting, and sharing what skilled signers do. Such efforts take advantage of the natural mechanisms in all languages, be they spoken or signed, for developing the vocabulary needed for communication by language users.

Parasnis, I. (2000). Cultural and language diversity and identity: Implications for deaf education. Proceedings of the 19th International Congress on Education of the Deaf and 7th Asia-Pacific Congress on Deafness. Sydney, Australia: APCD Secretariat.

This paper discusses the advantages and limitations of the sociocultural model of deafness, which views deaf people as a bilingual-bicultural minority group. The increasing ethnic and linguistic diversity among American deaf people suggests that a multicultural approach to deaf education that takes into account factors such as parental ethnic and linguistic background, race, and socio-economic status will provide deaf people with optimal access to language and information. The impact of diversity on the development of the self-identity and group-identity of deaf people is discussed. How to incorporate issues related to diversity in the educational experience of deaf people and the role teachers can play as agents of change are also discussed.

Implications

The concept of hearing and deaf professionals as allies is introduced and its implications discussed. Educational experiences of deaf students can be enhanced if teachers, counselors, and other professionals provide a supportive environment that respects individual differences as well as sociocultural differences within the deaf student population.

If you would like to obtain information in an area beyond what you see listed, you can write to the first author of closely related papers, c/o NTID. If you are unable to obtain one of the publications on this sheet from your local library, you may send this form to: Educational Technology Resource Room, National Technical Institute for the Deaf, 52 Lomb Memorial Drive, Rochester, NY 14623-5604.

_____*Berent, G.P., & Clymer, E.W. (2001). A Web-based initiative to infuse English across the curriculum for deaf and hard-of-hearing students.*

_____*Caccamise, F., & Lang, H.G. (2002). SIGNS for science and mathematics: A resource book for teachers and students, 2nd edition (available from bookstores or libraries).*

_____*Parasnis, I. (2000). Cultural and language diversity and identity: Implications for deaf education.*

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