

# NTID RESEARCH BULLETIN

Department of Research and Teacher Education · National Technical Institute for the Deaf · Rochester Institute of Technology

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## **Vital Signs: Optimizing the Teaching of Science and Mathematics Through Research**

By Harry G. Lang, Kim Kurz, and Chris Kurz

### **Introduction**

Studies of perceptions of the characteristics of *effective teachers* have shown that deaf students highly value an instructor's ability to use sign language clearly. This finding emerged in both a structured response study in which effective teaching was defined in terms of content learning (Lang, McKee & Conner, 1993) and in a study based on unstructured responses (critical incident technique) in which the interviews with deaf students focused on effective teaching in terms of motivation to learn (Lang, Dowaliby & Anderson, 1994). Yet, while such student preferences have been identified and a growing body of literature is now available on the linguistics of American Sign Language (ASL), little is known about the dimensions of signing and whether they influence learning in the classroom. How does sign selection and/or sign production by teachers (and interpreters) impact the construction of meaning in deaf students? Does the student's own selection/production of signs reflect understanding of the concepts represented by the signs, or is such selection an arbitrary process? Are deaf students able to mentally repair signing errors made by teachers, interpreters, and peers during the course of lectures or classroom discussions?

### **Background and Ongoing Studies**

Sign language research has the potential to inform classroom teachers, and researchers might expand

the current base of knowledge with additional studies applied to the classroom. As an illustration, Maynard, Slavoff, and Bonvillian (1994) reported that hearing undergraduate students unfamiliar with ASL who received the sign etymologies (origins or roots of a sign) while learning sign-word pairs demonstrated significantly better delayed recall than those who learned through sign motor rehearsal and those who received no coding instructions. This begs the question of whether emphasizing etymologies of signs during content instruction, when such is possible, may *help* deaf learners unpack information from long-term memory. If research supports such an unconfirmed hypothesis, teachers would do well to incorporate the approach into their instruction.

For example, a popular sign for the animal SEAL is found in a number of sign language resources and is based on the clapping or flapping motion of the mammal's rear flippers. Some teachers describe the same sign in terms of the clapping of fore flippers, a trained show behavior. It is physically impossible, however, for a seal (except for the fur seal) to clap its small fore flippers against one another. A sea lion, which is just one type of seal, may be trained to do this in captivity. For a science teacher interested in communicating specific characteristics of pinnipeds, the distinctions between these animals, their signs, and etymologies, may be important.

Other research studies have examined the signability of terms and its relationship to memory and cognition. Bonvillian (1983), for example, found that deaf students' recall was better for words that had sign-language equivalents. Similarly, in a study

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## **Notes of Note**

**Harry Lang** (NTID Research and Teacher Education) was selected as one of three members of the RIT faculty to receive the first-ever Trustees Faculty Scholarship Awards for the 2005-2006 academic year. Awarded by the Education Core Committee of the RIT Board of Trustees, this new award recognizes faculty who have established outstanding track records of academic scholarship "integral to, and not separated from, all aspects of a student's educational experience at RIT."

In addition, Lang's new book, *Teaching from the*

*heart and soul: The life and work of Robert F. Panara*, has been accepted for publication by Gallaudet University Press.

In association with their NSF-funded Catalyst Project for a Science of Learning Center on Mathematics and Deaf and Hard-of-Hearing Learners, **Ronald R. Kelly** and **Gerald P. Berent** (NTID Research and Teacher Education) presented "A multivariate

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Laurie Brewer is Associate Dean for Academic Administration at NTID.

*Laurie C. Brewer*

## Research to Practice: Creating Synergy Instead of Bridges

Since its inception, NTID has been charged by the United States Department of Education to investigate problems having to do with the social, educational and economic accommodations of deaf people, including evaluation and improvement of teaching techniques as they relate to the educational goals of all deaf students, wherever taught. Over the last 37 years, NTID's research and teaching faculty have made numerous important contributions to our understanding of the education and employment challenges that deaf and hard-of-hearing students face. The model for producing this success has been the traditional higher education model of hiring faculty with research credentials, interests and backgrounds that fit the mission of NTID and then giving them the freedom to creatively identify problems, design research projects, and share their results through professional presentations and publications. Although this model of research has much to recommend it, it also produces the classic gap between research and practice. The result is that often valuable research findings are not utilized in the design or delivery of curriculum and instruction. At NTID this gap is particularly troublesome, since the focus of research at NTID is applied, meaning the goal of research at NTID is precisely to enhance practice at RIT and at other postsecondary schools serving deaf and hard-of-hearing students across the United States.

Given this classic problem and the real possibility that NTID may be confronted with flat or reduced budgets, NTID initiated a process in 2003 to

examine how the college might bridge research and practice and focus our research efforts during fiscally challenging times. A faculty committee recommended a new research model that calls for creating long-term research plans in strategic areas which will be addressed by teams of research and teaching faculty.

### Research Vision

The vision in the new model is for NTID to be a national resource for research on educating deaf and hard-of-hearing students in mainstreamed settings, providing researchers and graduate students from across the country with an opportunity to work in critical issues that impact the education and upward mobility of deaf professionals in technical fields. The goal is to maintain an applied research program that advances fundamental scientific understanding while serving the needs of practitioners and policymakers.

### The New Research Model

To promote the application of research results in the schools and in businesses where deaf and hard of hearing professionals work, the new research model focuses on a limited number of critical educational, access, communication and employment issues. These issues are identified by consulting constituencies inside and outside of NTID. Teams of cross-disciplinary research and teaching faculty are formed to refine the problem statements and develop a series of research projects to address the issues. It is recommended that strategic research plans include classroom-based, action research that uses the most recent research in the design of new teaching strategies and the assessment of their

*Research to Practice continued on page 11*

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### *Vital Signs continued from page 1*

involving 20 geometry terms, Lang and Pagliaro (in progress) found that deaf high school students recalled significantly more words categorized as signable with a single sign than compound or combination of signs, or fingerspelling only. Whether these findings imply that teachers explaining terms that cannot be represented with a single sign should provide additional reinforcement to enhance recall remains to be investigated.

Stewart (2001) summarized William C. Stokoe's impressive work in describing the parameters of American Sign Language (ASL), and his efforts to show teachers how they may benefit from studying the linguistics of both English and ASL. "One real objective of the study of sign language," Stokoe (1976) wrote, "is the ultimate ability of the teacher to participate in the real, intimate, vital communication of deaf pupils..." (p.32). This should be true whether a school endorses ASL or a manual code for English. Most effective teachers recognize that they must often adapt their sign communication as a result of the heterogeneity of the students in the classroom. Teaching science and mathematics effectively through sign language requires a commitment to this *vital communication*.

One issue teachers often face in working toward this ideal of vital communication is variation in signs. In their examination of regional differences in American Sign Language, Shroyer and Shroyer (1984) reported, for example, 7 variations for CAT, 8 for CHICKEN, 10 for the color BROWN, 12 for LIGHT (electric), and 16 for SQUIRREL. More recently, Lucas, Bayley, Reed and Wulf (2003) demonstrated that variations are not only

regional, but they are also associated with specific users within regions. Lang et al. (submitted) examined variation of technical signs in the science classroom, summarizing their observations in a National Science Foundation grant project, Classroom of the Sea, that in addition to learning the meaning of terms and/or concepts, their spellings, and connections with one another, deaf students must also adjust to different teachers using different signs for the same concepts throughout the day. The authors raise the question whether the lack of agreement on signs may distract from the teaching of content and place additional cognitive demand on the deaf students. This study, and the Lang and Pagliaro (in progress) study with deaf mathematics students and teachers, reveal that teacher content knowledge is also important in examining the relationships among signing, teaching, and learning.

Caccamise and his NTID Technical Signs Project (TSP) colleagues helped lay the groundwork for systematic study of technical signs in the United States, calling for additional research to support direct classroom instruction and interpreting (e.g., see Caccamise et al., 1978). Their work included an examination of sign collection and invention, the use of synonyms, and the development of guidelines for standardization and development of technical signs. The Technical Signs Project at the National Technical Institute for the Deaf (NTID) resulted in a series of videotapes, books, and other products, including the book, *Signs for science and mathematics: A resource book for teachers and students* (Caccamise & Lang, 1996).

### *Vital Signs continued on page 4*

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### **Notes of Note** *continued from page 1*

methodology for assessing learners' English quantifier knowledge" at the Second Language Research Forum held at Teachers College, Columbia University, in October 2005. At the same conference, Berent and Kelly also presented "Deaf learners' improvement in L2 English through visual input enhancement."

In a study that included international students, Berent, Kelly and **Tanya Schueler-Choukairi** (RIT English Language Center) presented "Assessing deaf and bilingual students' quantifier knowledge" at the annual convention of Teachers of English to

Speakers of Other Languages (TESOL) in Tampa, FL, in March 2006.

Berent, Kelly, and NTID colleagues **Stephen Aldersley**, **Kathryn Schmitz**, (NTID Liberal Studies), **Baldev Kaur Khalsa**, (NTID American Sign Language and Interpreting Education), **John Panara** and **Susan Keenan** (NTID Liberal Studies), presented "Focus-on-form teaching methods promote deaf college students' improvement of

### **Notes of Note continued on page 4**

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### ***Vital Signs continued from page 3***

There have been similar efforts to develop lexical databases as resources in other countries. The products resulting from these efforts have included dictionaries and other collections of signs in print, and other lexical databases on videotapes, CDs, and the World Wide Web. There is little documentation, however, on the extent to which the developers of such databases have followed the rules of a country's dominant sign language in collecting and recording the signs.

### **Results to Date**

Currently, we are creating a lexical database of more than 900 Quicktime sign movies of science and mathematics terms. Typically, a strategy for identifying signs for terms unavailable in published resources is through consultation with experienced teachers. We, however, recommend that the perspectives of several content experts as well as linguists be combined to arrive at an appropriate sign for instructional purposes. Teachers with science or mathematics degrees and sign experience, both deaf and hearing, are in general the best resource for this process. Over time, this process of discussion in the context of instruction, and with ongoing influence from both linguistic and educational research, will result in useful resources. The systematic development of a lexical database in the current project includes two teams of native or near-native signers with degrees and/or certification in science or mathematics. The reviewers, with three or more years experience teaching, are examining each of the signs for conceptual accuracy. A linguist is also examining the signs to assure that they are

following as closely as possible the general rules of ASL. Several approaches are being used to address the issues of variation in this draft of the lexical database. In this corpus, *specificity* is accomplished through the use of parentheses [e.g., DIGIT (mathematics); VOCALIZATION (whales)]; or the use of multiple entries, such as in the case of one term having completely different signs in its noun and verb forms [e.g., FISH (n) and FISH (v)].

The lexicon project will also result in the development of guidelines and tips for optimizing communication of course content. The teaching tips being developed as an online resource for [www.deafed.net](http://www.deafed.net) will include demonstration movies of mathematics and science teachers using signs during instruction with and without spoken communication, print materials, and other graphics. This website supports the preparation of new teachers and the ongoing professional development of experienced teachers and is part of a grant awarded to the Association of College Educators - Deaf/Hard of Hearing (ACE-DHH). Along with NTID, ACE-DHH is supporting the lexicon evaluation and the development of resources.

After the features of technical signs are better understood through the evaluation and discussion of the technical signs, research will begin on examining the use of signs in the teaching-learning process. Studies are particularly needed on the deaf students' construction of meaning and factual recall as they relate to the semantics and etymologies of signs, the use of such features as initialization with students on different grade levels, and the issues of sign language convention or standardization as dimensions of communication

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### **Notes of Note *continued from page 3***

English grammar skills" at the Fourth Meeting of the English Think Tank: Literacy in the English Classroom and Beyond, held at NTID in June 2005.

Copies of the above papers are available from the NTID Department of Educational Design Resources ([EDRequest@RIT.EDU](mailto:EDRequest@RIT.EDU)).

Susan Keenan and Kathryn Schmitz presented "Perspectives on error correction for deaf students" at the March 2006 TESOL convention. Their presentation was among others devoted to Teaching

English to Deaf Students (TEDS), one of the topic areas represented by the TESOL Bilingual Education Interest Section. Next year's TESOL convention will be in Seattle, WA, March 20-24, 2007. For further information on TESOL 2007, visit [www.tesol.org](http://www.tesol.org). For information about submitting a TEDS proposal, contact Gerald P. Berent at [GPBNCI@RIT.EDU](mailto:GPBNCI@RIT.EDU).

**Raymond Grosshans** (NTID Industrial and Science Technologies) and Gerald P. Berent presented

Chris Kurz and Harry Lang adjust the cameras to capture the technical signs for the online lexical database for science and mathematics teachers.



in pedagogy. Building such a knowledge base through research may improve learning in all content areas of the curriculum and enhance the *vital communication* that makes teaching effective.

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## Project Access Workshop Planner's Guide

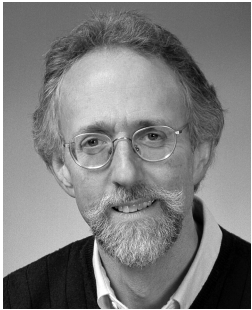
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*For presenting workshops to college faculty that promote access to instruction for deaf and hard-of-hearing students*

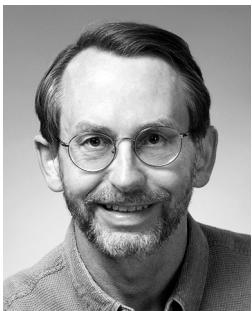
Written by a team of support service providers, faculty members, deaf students and researchers, this book is an outgrowth of past research and the final product from Project Access, a US Department of Education grant program directed by **Susan Foster** and **Gary Long** of the NTID Department of Research and Teacher Education. The book's eight chapters will help educators better understand the classroom challenges faced by deaf students, and use proven strategies to facilitate deaf students' learning.

The Project Access Workshop Planner's Guide and two CDs are available for \$35 at [www.booksurge.com](http://www.booksurge.com).

"An online technical vocabulary reference tool for deaf students," and Berent, **Daniela Janáková** (Charles University, Prague) and **E. William Clymer** (PEN-International, NTID) presented "A multimedia design model for planning and delivering professional development for teachers of deaf and hard-of-hearing students in the Czech Republic" at the Instructional Technology and Education of the Deaf Symposium at NTID in June 2005. These papers are available at [www.rit.edu/~techsym/proceedings.html](http://www.rit.edu/~techsym/proceedings.html).



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## Using ASL and ASR to Facilitate College Writing

By John Albertini, Michael Stinson, and Argiroula Zangana

### Introduction

According to one psychological description of the writing process, a writer must go back and forth between two *cognitive spaces*: content and rhetorical (Bereiter and Scardamalia, 1987).

In other words, when writers compose they must decide what to say and how to say it, given their purpose for writing and the intended audience. Like other adult bilinguals, deaf college students sometimes find that attention devoted to the *how* impedes their fluency of thought and ability to express complex ideas coherently. When they focus too much attention on choice of register (style), grammar, and mechanics, they lose ideas or the logical connections between them.

Writing teachers have used spoken dictation with beginning writers, second language learners and learning disabled students. Allowing students to compose their thoughts orally seems to help some students produce more lucid and coherent drafts. One study, for example, found that high school students with learning disabilities produced higher quality essays using dictation and speech recognition technology (Macarthur & Cavalier, 2004). This technology automatically converts speech to print. Biser et al. (1998) investigated the use of *mediated texts* as an accommodation for deaf students taking a college writing competency test. Here the student was allowed to sign the test with a sign language interpreter who voiced an English version of the student's signing onto an audiotape, which was later transcribed. In this example, not only mode but also language (ASL to English) was mediated.

In the present study, students signed first drafts of college English essays to a sign language interpreter who voiced an English version into a computer equipped with automatic speech recognition (ASR) software. In the last few years, ASR-based services have begun to be used as a support for communication access and learning for students who are deaf or hard of hearing or who have other disabilities (Harkins & Bakke, 2003).

The availability of increasingly powerful computers at relatively low cost and new advances in ASR software have fostered this development (Comerford, Makhoul, & Schwartz, 1997). In this pilot study we asked specifically 1) whether the use of ASL, an interpreter, and ASR would facilitate the composing process for deaf college students, 2) whether deaf students writing college essays would find the ASR-produced text helpful, and 3) what languages they normally used while writing.

### Procedure

Participants in this study (four female, six male) were recruited from college composition courses at the Rochester Institute of Technology. All students considered themselves good users of ASL (on a scale from 1 to 10, with 10 being "very good," the students' mean rating was 7.38; SD=2; N=9). Once agreeing to participate and after receiving a writing assignment in their composition course, a one-hour ASL-ASR writing session was arranged. In preparation for the session, each student was asked to think about the assignment and to prepare a mental outline or list of points to include in a draft essay.

At the ASL-ASR session, each student signed a draft and answered questions about the writing process. Signed drafts were videotaped and voice interpreted (see Figure 1). The voice interpretation

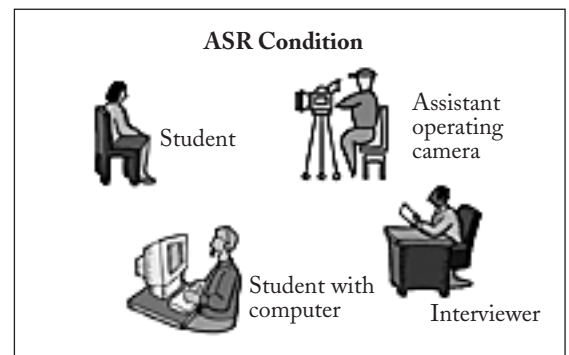


Figure 1.

was immediately converted to print, and the student received both print and videotape versions of the draft. After completing two assignments, one with

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# IMPLICATIONS OF NTID RESEARCH

FOR DEAF AND HARD-OF-HEARING PEOPLE • NTID RESEARCH BULLETIN

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*A primary mission of the Department of Research and Teacher Education 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 Department of Research and Teacher Education conducts research relevant to that goal and supports research conducted by colleagues from across NTID.*

*As part of its collaborative efforts, the Department of Research and Teacher Education regularly undertakes the collection and dissemination of relevant research findings from across NTID. NTID Papers and Publications is published every two years. Implications of NTID Research, published in alternate years, includes the implications of the research findings for each publication that the author thinks will be most relevant for NTID's audiences.*

**Marschark, M., Sapere, P., Convertino, C., & Seewagen, R. (2005). Access to postsecondary education through sign language interpreting. *Journal of Deaf Studies and Deaf Education, 10*, 38-50. [AN 1859]**

Despite the importance of sign language interpreting for many deaf students, there is surprisingly little research concerning its effectiveness in the classroom. In this study, involving more than 20 interpreters and more than 100 deaf students, students watched interpreted university lectures. The researchers explored the effects of a match or mismatch between student interpreting preferences and the actual form of interpreting (interpreting vs. transliteration), student-interpreter familiarity, and interpreter experience. Student language and educational histories also were considered.

### **Implications**

Results extended earlier studies, showing that these had relatively little impact on learning relative to other factors. Issues relating to access and success in integrated academic settings are discussed in the context of these findings and related research.

**Whitehead, R.L., Schiavetti, N., MacKenzie, D.J., & Metz, D.E. (2004). Intelligibility of speech produced during simultaneous communication. *Journal of Communication Disorders, 37*, 241-253. [AN 1832]**

This study investigated the overall intelligibility of speech produced during simultaneous communication as perceived by hearing-impaired listeners. Although results indicated longer speech production during simultaneous communication versus speech produced during speech alone, results showed no difference in overall intelligibility of speech produced during simultaneous communication versus speech produced during speech alone, nor any difference in pattern of phonetic contrast recognition errors during simultaneous communication. Thus the temporal alterations produced by simultaneous communication do not produce degradation of temporal or spectral cues in speech or disrupt the perception of specific English phoneme segments.

### **Implications**

It is reasonable to conclude from this research that because the speech produced during simultaneous communication does

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not disrupt the phonetic rules of spoken English, speech intelligibility is preserved for listeners, thereby indicating that simultaneous communication is appropriate for use as a speech model to present to hearing-impaired children and as a mode of communication with hearing-impaired adults.

**Foster, S., & Kinuthia, W. (2003) Deaf persons of Asian American, Hispanic American, and African American backgrounds: A study of intraindividual diversity and identity. *Journal of Deaf Studies and Deaf Education*, 8, 271-290. [AN 1843]**

This paper explores ways in which deaf college students who are members of minority racial groups think about and describe their identity(ies). Results suggest that each person is a constellation of many parts, some of which are stronger than

others, resulting in a contextual and interactive model of identity that includes an Individual, Situational, Social, Societal, and a Biographical component, reflected in changes in identity that occur over time.

### Implications

Deaf minority students may have difficulty verifying both their deaf and racial or ethnic minority identities, and as a result experience stress and conflict. Those who administer educational programs that separate deaf students from the general school population and/or from their local neighborhoods must consider the unintended consequence of distancing deaf minority students from their parents' cultures. Separate or special schools should provide information and support for the diverse cultures represented in their student populations, and find ways to increase the involvement of parents from Asian, Black, and Hispanic cultures in school events and programming.

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\_\_\_\_\_ Marschark, M., Sapere, P., Convertino, C., & Seewagen, R. (2005). *Access to postsecondary education through sign language interpreting.* [AN 1859]

\_\_\_\_\_ Whitehead, R.L., Schiavetti, N., MacKenzie, D.J., & Metz, D.E. (2004). *Intelligibility of speech produced during simultaneous communication.* [AN 1832]

\_\_\_\_\_ Foster, S., & Kinuthia, W. (2003). *Deaf persons of Asian American, Hispanic American, and African American backgrounds: A study of intraindividual diversity and identity.* [AN 1843]

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*Using ASL and ASR continued from page 6*

ASR support (the *ASR condition*) and one without ASR support (the *standard condition*), the student returned for a short, evaluative interview. In these sessions, students supplied ratings of the quality of ASR and standard drafts, ratings of the importance of transcription errors for readability of the ASR text, and information about their composing process. In addition, we obtained objective ratings of the written drafts.

**Results**

Table 1 displays the student ratings of the quality of the drafts. The mean rating of 4.78 (out of 10) for the standard drafts, indicates that students rated

| Rating                    | M    | SD   | N  |
|---------------------------|------|------|----|
| Quality of standard draft | 4.78 | .99  | 7  |
| Quality of ASR draft      | 6.65 | 1.70 | 10 |
| Quality of ASR text       | 5.85 | 1.84 | 10 |

**Table 1.**  
*Mean standard ratings on questions about use of ASR to support writing*

*Rating scale:*  
1 = Poor  
10 = Very Good

these drafts as somewhat poor. The most frequent rating was a 4. The mean rating of the ASR drafts was 6.65 indicating that students thought these drafts were better quality than the standard. Three out of the 10 ratings were 6's; 5 out of the 10 were higher than 6. Students also rated the quality of the texts produced with ASR. The mean rating of 5.85 indicates students thought these were somewhat helpful.

Even though the interpreter corrected most transcription errors before giving the text to the students, some remained. We asked students whether these errors caused difficulty when composing revised written drafts. The mean rating of 2.66 (0="Don't really bother me"; 10="Bother me a lot"; SD=1.49; N=6) indicates that, in general, the mistakes did not bother students. We also asked

students to rate the extent that mistakes affected understanding of the text. The mean rating of 5.83 (0="Not at all"; 10="Very much"; SD=3.13; N=6) suggests that mistakes caused some difficulty in understanding the text (but see qualitative comments).

The discrepancy in these ratings suggests that although students may have had difficulty understanding a text segment when there was an ASR error, this difficulty did not hinder production of the next draft. Presumably their familiarity with the material meant that they could easily figure out the meaning of the text.

Table 2 shows the results of the objective scoring of two draft essays (ASR and Standard) for five of the students. These drafts were given to a team of five expert raters who were rating writing samples of other new students for placement in developmental writing courses. The raters were not told in what order or under what conditions these additional samples had been written. Three raters independently rated each sample, and the average of their ratings yields the score given in the Table.<sup>1</sup> While the number of comparisons is too small to draw conclusions, the results suggest that the ASR procedure could affect quality of writing.

For a thematic analysis of students' reactions to the ASR procedure and their descriptions of the composing process, student responses to the interview questions were transcribed from videotape by the interpreter using ASR software. These transcripts were coded independently by two of the investigators (the coding categories were the interview questions) who met to resolve any questionable responses. In response to the question, "Did the ASR text help you write a draft?" six students responded positively and one negatively:

Student 1: "Yes, it gave me like something more to write about it."

<sup>1</sup> *The ratings are modified holistic ratings. Raters are asked to assign a total of 25 points to each of four categories: organization, content, vocabulary, and language. The total score for each paper may range from 0 to 100 points.*

*Using ASL and ASR continued on page 10*

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*Using ASL and ASR continued from page 9*

Student 2: "Yes, better."

Student 3: "Yeah, I felt it helped because it gets me thinking."

Student 4: "Yes, in some ways. Yes, it seemed most was exactly what I had signed. Yes, it was good for writing a rough draft."

Student 5: "I read the printout and it had a lot of ideas, so that helped me write a rough draft of the essay. When I looked at the paper I'd realize what I forgot to include and then I could add that to my draft."

Student 6: "I read it [the printout] once or twice, but I didn't really analyze it. But was that a benefit to me in writing my paper? Not really."

In response to questions about transcription errors (Did you find mistakes in the text? What kind of mistakes? Did the mistakes affect your understanding of the text?), four out of seven students said they found more than just typos in the text. Three said

Apparently some students think in sign while composing. In response to the questions about which languages were used while composing, six of the ten said English; however, four said signing or a mixture of signing and English. One student reported that ideas come in the form of people signing.

**Conclusions**

Results of using this experimental procedure with ten students in college level writing courses indicated that, in general, they liked the procedure, had some difficulty with the errors in the ASR-produced text, and believed drafts written using an interpreter and ASR were qualitatively better than those written without the procedure. The number of drafts rated objectively was too small to draw any conclusions about actual effect on quality of writing. Yet, for those students who compose in ASL or in a mixture of ASL and English, such a procedure may allow them to focus more on content and lead them to produce a more coherent written draft.

Because ratings and comments about the procedure were generally positive, it seems that ASR holds promise as a tool for writing under certain conditions. This study was conducted under naturalistic conditions; replicating it with a larger sample in both naturalistic and experimental settings would lead to more definitive results. As several students commented, the procedure works best when students prepare a mental outline ahead of time for the ASR condition. For others, it was clear that only a pronounced difference in process or product would compel them to invest the additional time required by the procedure. Even with more training of the voice files and improved software, transcripts from the ASR condition will need to be edited. Reliability of the transcripts could be estimated if more than one interpreter were used; accuracy could be judged by having students transcribe their own sign production. Finally, issues of control and authenticity of the product (with involvement of an interpreter) were not as much an issue here as they would be if the procedure were used for assessment purposes.

| Student | ASR Draft Score | Standard Draft Score | Higher Score |
|---------|-----------------|----------------------|--------------|
| 1       | 55              | 53                   | ASR          |
| 2       | 77              | 59                   | ASR          |
| 3       | 79              | 75                   | ASR          |
| 4       | 61              | 63                   | Standard     |
| 5       | 58              | 75                   | Standard     |

**Table 2.**  
*Quality of drafts: Objective scoring*

that words in the texts were different from what they signed or fingerspelled. One said that the message in the text was less direct than the signed message. As to the effect of the errors (or changes) in wording, three said that the changes impeded understanding, and one said that the changes aided understanding: "Yes. That transcript made me understand my story because the words were different."

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### **Research to Practice continued from page 2**

impact on student learning. Because the issues selected for research are those that practitioners help to identify as key to improving student learning and because by working together, research and teaching faculty will show the impact on student learning, I believe we can close the gap between research and practice by eliminating the separation, rather than by building bridges.

Another aspect of the model calls for soliciting faculty, graduate students, and post-doctoral fellows from other colleges and universities who

have expertise essential to the success of the strategic research agenda to join the core team of NTID research faculty. This aspect of the model proposes that we utilize our national talent to address issues and that researchers from across the nation interested in the education and employment of individuals who are deaf be involved in moving the research forward. By providing an opportunity for the best minds from across the nation to address key issues, I believe we are more likely to make significant progress on some of the difficult questions that have challenged the field since its beginning.

### **New NTID Research Agenda**

In order to position NTID's Research Program within a strategic context, we contacted important constituencies to assist in identifying areas of research and key research questions to be pursued. These constituent groups included NTID faculty and staff, NTID research faculty, our National Advisory Group, accomplished research scientists external to the college, key parent and civic organizations, and related professional and educational organizations.

After reviewing the summary of internal and external feedback on possible areas of Strategic Research and Strategic Research Questions, and the analysis of the feedback prepared by the Department of Research and Teacher Education, the NTID Administrative Team affirmed that for the next five to ten years NTID will focus its research efforts on four areas of applied research:

1. Technology, access and support services
2. Teaching and learning
3. Job access and mobility
4. Faculty and staff communication skill development

### **Will the New Research Model work?**

The new model has been articulated, the strategic areas of research identified, proposals submitted and new teams of research and teaching faculty are being formed. So the only question left is, will it work? To be continued....

*Dr. Brewer is Professor and Chair of the Research Model Working Group*

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*Kim Kurz, Chris Kurz and Harry Lang developed more than 900 Quicktime movies for an evaluation of conceptual representation by experienced signers with degrees in science or mathematics. The laptop and camera system for this project were loaned to them by the NTID Instructional Technology Consortium. See the article starting on p.1.*

