# Teaching and Learning

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**Berent, G.P. (2005). Coding deaf and hard-of-hearing students' successful and unsuccessful English productions. In D. Janakova (Ed.),** ***Proceedings 2004: Teaching English to Deaf and Hard-of-Hearing Students at Secondary and Tertiary Levels of Education in the Czech Republic*** **(pp. 109-115). Prague, Czech Republic: Eurolex Bohemia. [AN 1851]**

*This project involved the creation, use, and testing of a flexible system for coding deaf students' successful and unsuccessful English language productions as expressed, for example, in typed paragraphs or essays. Using the students' own written communication, the instructor applies the coding system to a specific set of target formations so that students' original "output" becomes new "input," enhanced with indications of successful and unsuccessful formations (but not teacher corrections). For example, the instructor enters the symbol +PST before the successful and context-appropriate production of a verb in the past tense but –PST before an unsuccessful attempted past tense form or a non-past form in a context that requires a past tense. Comparison of the enhanced coded successes and non-successes leads students to infer and produce the correct forms during the revision process. The flexible coding system contains different sets of codes signifying English forms at the levels of morphology, syntax, vocabulary, semantics, discourse, and rhetoric.*

**Implications**

The flexible coding system can be applied to deaf students' productive written English at virtually every level of education. Teachers can teach students one small set of codes at a time and the forms that the codes represent. By indicating both successful and unsuccessful productions rather than noting only errors, teachers can more easily motivate their students to increase the frequency of their successful productions over time. Teachers can calculate students' current relative levels of knowledge among several different formations or, longitudinally, can calculate the extent to which students improve on specific formations over time. This procedure allows teachers to experiment with different English teaching methods to determine which appear more effective than others. The successful employment of this coding system methodology has been demonstrated in research that revealed greater gains in English language improvement by deaf students who were taught using this system than by students who were taught without it in different sections of the same course.

**Berent, G.P. (2005). Input-enhancement in teaching English to deaf and hard-of-hearing students. In D. Janakova (Ed.),** ***Proceedings 2004: Teaching English to Deaf and Hard-of-Hearing Students at Secondary and Tertiary Levels of Education in the Czech Republic*** **(pp. 75-87). Prague, Czech Republic: Eurolex Bohemia. [AN 1850]**

*This article reviews the role of "input" in language acquisition and discusses the "Focus-on-Form" teaching methodology known as "input enhancement." The rationale for input enhancement is driven by theories of second language acquisition that maintain that students must "notice" target language input—for example, specific grammatical formations—before they can actually incorporate that input into their repertoire of grammatical knowledge. Input*

*enhancement methods include many visual techniques such as textual enhancement (underlining, bold, or a different font) of specific formations in order to get students to notice these formations. Although Focus-on-Form methods have been used for many years with hearing learners of English, they have not been formally used for teaching English to deaf students. Classroom research on visually based Focus-on-Form English teaching methods for deaf students needs to be conducted.*

**Implications**
Because Focus-on-Form methodologies can be delivered easily through visual means and because deaf students are visual learners, visual input enhancement may offer a long-sought solution to helping deaf students make greater improvements in their English language and literacy skills than they have been able to make in the past. Such improvement is critical to deaf students' educational and career success. The proposal to conduct classroom research on visually oriented Focus-on-Form methods with deaf students is indeed proving successful. A recently completed follow-up study by the author and colleagues has validated the efficacy of visual Focus-on-Form methods used with deaf students. The recent study resulted in significantly greater improvement in English grammar by deaf students taught with visual input enhancement than by students taught with other English teaching methods. Continued research and experimentation with many different visually oriented Focus-on-Form methods is therefore essential.

## Bull, R., Marschark, M., & Blatto-Vallee, G. (2005). SNARC hunting: Examining number representation in deaf students. *Individual Differences and Learning*, 15, 223-236. [AN 1875]

*Previous studies exploring deaf students' judgments of relative magnitudes have shown them to respond more slowly than hearing peers. The source of the difference remains to be determined. Five experiments were conducted to further explore the nature of the "internal number line" in deaf students compared to hearing peers (for which its properties are well established). The results indicated that deaf students are slower than hearing students in comparing relative magnitudes. However, the "internal number lines" that underlie mathematics performance appear to be the same for deaf and hearing students.*

**Implications**
This pattern of results explains differences in math performance between the two groups an suggests alternative teaching methods that can help overcome lags in that area evident beyond the seventh grade level.

## Cuculick, J.A., & Kelly, R.R. (2003). Relating deaf students' reading and language scores at college entry to their degree completion rates. *American Annals of the Deaf 148*(4), 279-286. [AN 1723]

*Graduation patterns were examined for 905 deaf students (1990–1998) at the National Technical Institute for the Deaf. Students with higher reading and language skills had the best overall graduation percentage. Comparison of recipients of different degrees such as bachelor of science (BS) versus fine arts (BFA); associate of applied science (AAS) versus occupational studies (AOS) showed that 92% of BS and 82% of AAS graduates were reading*

*at the 9th-grade level or above, versus 65% of BFA and 47% of AOS graduates. Interestingly, 80% of non-degree-earning students read at the 9th-12th grade levels, and in absolute terms, they outnumbered graduates with similar reading skills in the AAS and BFA programs combined, and in the BS program. Students performed similarly across degree categories, regardless of curriculum requirements and difficulty. Only non-degree-earning students had significantly lower grade averages.*

**Implications**
The importance of these research findings are two fold: college success of deaf students as defined by degree completion rates is clearly associated with reading achievement levels at 9th grade or higher; and, while reading is critically important to college degree completion, other factors are also at play, as evidenced by the fact that 80 percent of the deaf students not earning a degree also were reading in the 9th-12th grade range levels. These findings indicate a need for improved counseling, placement, and retention strategies.

**Davis, S.M., & Kelly, R.R. (2003). Comparing deaf and hearing college students' mental arithmetic calculations under two interference conditions. *American Annals of the Deaf 148*(3), 213-221. [AN 1770]**

*This study compared the mean reaction times (RT) of deaf higher and lower level readers (n = 30) with hearing college students (n = 14) on a mental calculation task for verifying the accuracy of addition and multiplication problems while their thought processes were simultaneously subjected to either tapping or voicing interference. The mental calculation performance of both the deaf students with higher reading skills and the hearing students were clearly affected by the voicing interference as compared to the tapping condition. This suggests that they were using some form of articulatory loop or inner voice for the mental verification task. In contrast, the group of lower reading deaf students showed no differential performance between the two interference conditions and exhibited slower responses across all experimental tasks. This may indicate a less efficient use of working memory and internal processing codes by deaf students with low reading ability. Additionally, the lower reading deaf students were significantly less accurate across all mental calculation tasks as compared to both the higher deaf readers and hearing students. Overall, the higher-reading deaf college students exhibited performance patterns similar to the hearing college students for both RT and accuracy.*

**Implications**
The development of mental calculation skills is important because it stimulates higher-level mathematical thinking skills. Reference sources are provided for teachers who want to improve the mental calculation strategies of their deaf students through mental arithmetic experiences.

**Foster, S., Long, G., Ferrari, J., & Snell, K. (2004). Providing access for deaf students in a technical university in the United States: Perspectives of teachers and instructors. In D. Power, & G. Leigh (Eds.), *Educating deaf students: Global perspectives* (pp. 185-195). Washington, D.C.: Gallaudet University Press. [AN 1876]**

*This article examines the experiences of deaf students and their instructors in mainstream college classes. Both quantitative and qualitative procedures were used to examine studen access to information and their sense of engagement in learning. Instructors were asked to discuss their approach to teaching and any instructional modifications made to address the needs of deaf learners. Results indicate that deaf students viewed classroom communication and engagement in a similar manner as their hearing peers. Deaf students were more concerned about the pace of instruction and did not feel as much a part of the "university family" as did their hearing peers. Faculty generally indicated that they made few if any modifications or deaf students and saw support service faculty as responsible for the success or failure of these students.*

**Implications**

There are several implications from this study. First, emphasis should be given to the similarities between deaf and hearing students and those instructional practices that enhance learning for everyone. Second, instructors should be selected for interventions who are interested and willing to modify their teaching strategies to facilitate inclusion of all students. Third, intervention strategies should be practical and reasonably easy to implant. Examples include seating interpreters near the lecturer in order to decrease the visual distance between the instructor and the interpreter, providing handouts of notes that will be displayed on the board during class, or pausing and counting to five after asking a question to facilitate inclusion of deaf students. Fourth, strategies should be disseminated through user-friendly vehicles, e.g., a web site that can be accessed at any time with a list of options rather than traditional workshops that often disrupt busy schedules and require travel to central locations on campus. Fifth, excellence in teaching should be rewarded. The power of professional recognition, merit increments, and positive appraisals cannot be underestimated in changing the behaviors of instructors.

## Kelly, R.R., Lang, H.G., Mousley, K., & Davis, S. (2003). Deaf college students' comprehension of relational language in arithmetic compare problems. *Journal of Deaf Studies and Deaf Education, 8*(2), 120-132. [AN 1743]

*This study examined 80 deaf college students' performance for solving compare-word problems where relational statements were either consistent or inconsistent with the arithmetic operation required for the solutions. The results support the consistency hypothesis proposed by Lewis and Mayer (1987) based on research with hearing students. That is, deaf students were more likely to miscomprehend a relational statement and commit a reversal error when the required arithmetic operation was inconsistent with the statement's relational term (e.g., having to add when the relational term was "less than"). Also, the reversal error effect with inconsistent word problems was magnified when the relational statement was a marked term (e.g., a negative adjective such as "less than") rather than an unmarked term (e.g., a positive adjective such as "more than"). Reading ability levels of deaf students influenced their performance in a number of ways. As predicted, there was a decrease in goal monitoring errors, multiple errors, and the number of problems left blank as the reading levels of students increased. Contrary to expectations, higher reading skills did not affect the frequency of reversal errors.*

**Implications**

Based on these findings, it is recommended that teachers of deaf students provide instruction and practice for a variety of representational strategies (both written and graphic), multiple-step problems, and increasingly complex compare problems with a variety of comparative

language. Teachers should also help students develop strategies to evaluate the reasonableness of their plans and solutions relative to specific problem parameters.

**Kelly, R.R., Lang, H.G., & Pagliaro, C.M. (2003). Mathematics word problem solving for deaf students: A survey of practices in grades 6-12. *Journal of Deaf Studies and Deaf Education, 8*(2), 104-119. [AN 1744]**

*This study surveyed 133 mathematics teachers of deaf students (grades 6-12) on their instructional practices for mathematics word problem solving. Half the respondents were teachers from center schools and the other half from mainstream programs. The later group represented both integrated and self-contained classes. The findings showed that regardless of instructional setting, deaf students are not being sufficiently engaged in cognitively challenging word problem situations. Overall, teachers were found to focus more on practice exercises as compared to true problem solving situations. More emphasis was given to problem features, possibly related to concerns about language and reading skills of students, with significantly less emphasis on analytical and thinking strategies. Consistent with these emphases, teachers gave more instructional attention to concrete visualizing strategies versus analytical strategies. The results also showed that in two of the three types of educational settings, the majority of instructors teaching mathematics and word problem solving to deaf students lacked adequate preparation and certification.*

**Implications**

The responses of those certified in mathematics support the notion that preparation and certification makes a difference in the kinds of word problem solving challenges provided to deaf students. The results also suggest that teachers of deaf students typically do not challenge their students cognitively in solving mathematical word problems. This could be related to a number of contributing factors such as insufficient teacher preparation in mathematics; low teacher perceptions and expectations of deaf students' capabilities, thus limiting how they expose students to more challenging problem solving situations; and the perception that English skills are the primary barrier to learning, causing teachers to emphasize comprehension strategies, while neglecting the complete analytical process of problem solving.

**Kelly, R.R., & Mousley, K. (2001). Solving word problems: More than reading issues for deaf students. *American Annals of the Deaf, 146*(3), 253-264. [AN 1725]**

*This study presented 44 deaf and hearing college students 30 mathematics problems to solve. The initial 15 were presented as numeric/graphic mathematical problems, followed by 15 corresponding mathematical word problems, with both conditions sequenced for a progressive increase in problem complexity Each word problem described the kind of shape and measurement information that was presented in its corresponding numeric/graphic problem. The deaf students were divided into three reading ability groupings. The results showed that the deaf college students, regardless of reading level, were comparable in performance to the control group of hearing college students for solving the numeric/graphic math problems and the initial, least complex set of corresponding word problems. However, as the descriptive information demands in the word problems increased to describe the more complex problem situation, the performance scores of the deaf students decreased regardless*

*of reading abilities. No comparable decrease was observed in the hearing students' performance. While higher reading ability levels were associated with the deaf students' word problem solving success, the analyses show that other factors also contributed to deaf students' performance on the word problems. These other factors included computation errors (rather than procedural errors), leaving word problems blank, and a negative, disengaged approach to the word problem solving tasks.*

**Implications**
These findings showed that successfully solving mathematical word problems involves more than reading comprehension. In addition, teachers need to emphasize the complete problem solving process, including the analytical and evaluative components, to deaf students. Teachers of deaf students need to persist in providing word problem experiences so students become comfortable and confident with this genre of problem solving, and do not develop avoidance strategies and negative attitudes about text descriptions for problem situations.

**Marschark, M., Convertino, C., & LaRock, D. (in press). Optimizing academic performance of deaf students: Access, opportunities, and outcomes. In D.F. Moores & D.S. Martin (Eds.),** ***Deaf learners: New developments in curriculum and instruction*****. Washington, D.C.: Gallaudet University Press. [AN 1877]**

*This chapter provides an overview of what we know (and do not know) about deaf children's cognitive development and how it influences academic achievement. A synthesis of available research clearly indicates that "deaf children are not hearing children who cannot hear" and, as a result, that if we want to optimize educational opportunities for deaf students we need to adjust instructional methods to account for their strengths and needs.*

**Implications**
Such conclusions provide important cautions for those who advocate mainstream education for deaf students, particularly with regard to the need to understand the underpinnings of learning if students are to be placed in appropriate educational settings.

**Marschark, M., Pelz, J., Convertino, C., Sapere, P., Arndt, M.E., & Seewagen, R. (in press). Classroom interpreting and visual information processing in mainstream education for deaf students: Live or Memorex®?** ***American Education Research Journal.*** **[AN 1878]**

*Three experiments examined the extent to which videotaped signing, remote interpreting, and similar technologies provide sufficient information for student comprehension in the classroom, relative to live interpreting. Such technologies offer lower cost and increased efficiency of services, but no one has yet determined if they support learning or impede it. Contrary to expectations, neither the lack of interpreter-student feedback nor the loss of 3-D information created by video-based interpreting reduced comprehension of lecture content.*

**Implications**
The findings have both practical implications for the classroom (the utility of video-based

interpreting) and theoretical implications (lack of 3-D information does not impair full comprehension of sign language by deaf students).

**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*(1), 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.

**Stinson, M., & Foster, S. (2000). Socialization of deaf children and youths in school. In P. Spencer, C. Erting, & M. Marschark (Eds.), *The deaf child in the family and at school* (pp. 151-174). Mahwah, NJ: Lawrence Erlbaum Associates. [AN 1659]**

*This chapter has three sections. The section "Elements of Socialization" describes those key processes that are essential to the social development of deaf and hard-of-hearing youths in school settings, including access to formal as well as informal communications, peer interactions, and the unwritten curriculum. These processes enhance students' acquisition of social information and eventual acculturization through incidental learning experiences unplanned events), social engagement with others, and development of a positive individual was well as group identity. "Educational Practice and Socialization" describes those educational practices that either promote or inhibit the development of optimal conditions for socialization in schools, including predominant models for education of deaf and hard-of-hearing students and placement trends since the mid-1970s, the impact of these models on socialization, and new and innovative educational models and practices that may enhance socialization of deaf and hard-of-hearing students in a variety of educational settings. The chapter concludes with recommendations for future research and innovative practice regarding the personal and social development of deaf and hard-of-hearing persons in school settings.*

**Implications**
Interviews with deaf persons about their experiences in various kinds of school settings suggest that often they feel they must choose between opportunities for social development and academic growth (Foster, 1989). Students should not have to choose between one kind of experience and the other; both are important. What should educators do to maximize the chance that deaf and hard-of-hearing students experience the full range of their development needs during their school years? Following are several suggestions. First, counselors and

educators who work with deaf students and their parents need to consider the impact of different educational settings on the academic, communication, and social development of deaf children and youth. Careful attention must be given to individual differences in placement and monitoring of student progress. Second, programs with inclusive approaches need to make special efforts to make the full range of formal and informal school activities accessible to deaf students. Third, both separate and mainstream programs must recognize and compensate for limitations inherent in their settings. Fourth, there is a need for continuing research on effective practice regarding education of deaf and hard-of-hearing students in various settings.

**Stinson, M.S., & Kluwin, T.N. (2003). Educational consequences of alternative school placements. In M. Marschark & P. Spencer (Eds.),** ***Oxford handbook of deaf studies, language, and education*** **(pp. 52-64). New York: Oxford University Press. [AN 1842]**

*This chapter discusses the following four categories of alternative placements: separate schools, resource rooms and separate classes, general education classes, and co-enrollment classes. Two questions that immediately occur regarding these options are: "What are the differences in the experiences of students in these alternative placement types?" "What are the differences in the characteristics and attainments of students in these placement types?" A more complex question is "Is it possible to relate these different educational experiences to characteristics and attainments of the students?" That is, do different experiences produce different educational consequences? The second and third sections of this chapter consider the research that best answers these questions. The first section provides background, description and conceptualization that aids understanding of the research that this chapter reviews and of thinking in the field in regard to alternative types of placement.*

**Implications**

It is desirable for educators to be aware that personal characteristics that may have been a basis for placement and those characteristics that are due to the placement experience itself are inextricably connected. In addition, studies have shown that individual differences in students account for 95 percent of the explained variance in achievement and that placement only accounts for a small portion of the explained variance. For educators working to improve academic achievement, these findings point to the importance of educators focusing primarily on individual students and the individual learning setting rather than primarily on the students' general type of placement. In regard to fostering social development, this review of research suggests that it may be desirable for educators to obtain a detailed assessment of the student characteristics and of the student's educational situation, and to develop a plan that is specific to these assessments. That is, it may be fruitful for educators to consider what can be done for specific kinds of students in specific situations, realizing that there is considerable variation within a given placement alternative. Several of the research studies reviewed reported potential interventions that might be used.

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***Note:*** *[AN XXXX] represents a local NTID publications designation. Please include when requesting copies of these publications.*