# THE EFFICACY OF ASL/ENGLISH BILINGUAL EDUCATION: CONSIDERING PUBLIC SCHOOLS

**THE STUDY investigated the efficacy and viability of American Sign Language (ASL)/English bilingual education for public schools serving deaf and hard of hearing children. Prior research related to ASL/English bilingual education is reviewed. Quantitative data related to the reading comprehension achievement of 25 deaf and hard of hearing students that were collected for the study are analyzed. The subjects' school program is described in depth. Overall performance of the sample is discussed. A description of high and low gainers is included. A statistically significant correlation between years of ASL usage and reading achievement is identified. Implications for the implementation of ASL/English bilingual methodology are reviewed, and suggestions for future research are offered.**

**MELISSA DELANA, MARY ANNE GENTRY, AND JEAN ANDREWS**

ALL THREE AUTHORS ARE AFFILIATED WITH LAMAR UNIVERSITY, BEAUMONT, TX, DEPARTMENT OF DEAF STUDIES AND DEAF EDUCATION. DELANA IS A DOCTORAL CANDIDATE AND INSTRUCTOR, GENTRY AN ASSISTANT PROFESSOR, AND ANDREWS A PROFESSOR, AS WELL AS PROGRAM COORDINATOR FOR GRADUATE PROGRAMS IN DEAF STUDIES/DEAF EDUCATION.

Accountability efforts have placed American deaf education under substantial scrutiny. Pressures from federal mandates, especially those tied to the No Child Left Behind Act (NCLB), have left educators seeking solutions to a major literacy dilemma: The average reading achievement of students who are deaf or hard of hearing remains well below that of their age-matched hearing peers (Cawthon, 2004; LaSasso & Lollis, 2003; Padden & Ramsey, 1998), with approximately half of all high school graduates with hearing loss reading below the fourth-grade level (Holcomb & Peyton, 1992; Holt, Traxler, & Allen, 1997). Ineffective pedagogy has fueled a cycle of low expectations (Fernandes, 1997; Johnson, Liddell, & Erting, 1989) that has lead to the implementation of curriculum that does not parallel the mandated standards established for these students' hearing peers (Bowe, 1991). With NCLB requiring that all students achieve performance at grade level by the end of the 2013–2014 school year, the need for instructional reform is evident.

Historically, academic paradigms have implied that deafness impedes literacy, intensely focusing on student deficiencies (Mogford, 1988; Perfetti & Sandak, 2000; Quigley, Power, & Steincamp, 1977). However, the cause of poor outcomes for students may stem from instructional weaknesses, not insufficient student ability (Bowe, 1991; Johnson et al., 1989; Nover, Andrews, Baker, Everhart, & Bradford, 2002;

Supalla, 1994). By taking a fundamentally different approach to the literacy dilemma, current research has focused on improving inadequate methods by capitalizing on each child's full linguistic repertoire (Nover, Christensen, & Cheng, 1998). This alternative paradigm considers linguistic, cultural, and educational implications more than the actual sensory disability (Charrow, 1981; Nover & Moll, 1997; Padden & Humphries, 1988). Supporters of this model have promoted American Sign Language (ASL)/English bilingual education to support the academic success of deaf and hard of hearing children (LaSasso & Lollis, 2003; Nover et al., 2002; Strong, 1995).

Dual language methodology is not new. Indeed, the concept of using dual languages in deaf education has been available since the early 19th century (Kannapell, 1974). However, the dual language approach was discontinued during the push for oralism after the Milan Conference of 1880 and decisions by the Conference of Educational Administrators of Schools and Program for the Deaf in the mid-1920s (Nover, 2000). A reemergence, evident in the last two decades (Johnson et al., 1989; LaSasso & Lollis, 2003; Strong, 1995), has created a change in teacher training options, as programs in France (Bouvet, 1990), Denmark (Hansen, 1994), the United States (Padden & Ramsey, 1998), and England (Knight & Swanwick, 2002) have begun to see promising results. As training options have become more available, the forward momentum continues.

Strong (1995) described only 9 schools using bilingual methods in 1995 and LaSasso and Lollis (2003) found only 19 in 2003. The Center for ASL/English Bilingual Education and Research (CAEBER), the leading entity for in-service training efforts in the United States, has reported training at least 274 mentors since its inception in 1997 (V. Everhart, personal communication, autumn 2006). In turn, these mentors have trained in-service teachers at their 20 respective school sites (V. Everhart, personal communication, autumn 2006). Simultaneously, eight university programs—California State University (Northridge), Gallaudet University, Lamar University, McDaniel College, Western Oregon University, the University of Hawaii, the University of Pittsburgh, and the University of Tulsa—have used the CAEBER curriculum in the training of hundreds of preservice teachers (V. Everhart, personal communication, autumn 2006).

In addition to accounts of increased training efforts, much dialogue on the methodology has been presented in the literature. Few writers, however, are substantiating or refuting claims with rigorous quantitative research. In the past decade the profession's three national journals, the *American Annals of the Deaf,* the *Journal of Deaf Studies and Deaf Education*, and *Sign Language Studies*, have published only one article (i.e., Andrews, Ferguson, Roberts, & Hodges, 1997) providing any empirical data specifically on the issue of dual language methodology. Related journals and university dissertations have not provided much literature, either. (A list of studies and their results is provided in Table 1). While these studies may indicate *promise* for the methodology, sample sizes are small and cannot be generalized back to the total population served in the United States. Clearly, additional investigation is needed.

Another limitation of these studies is that most of them targeted residential programs for the deaf. Adopting a sociolinguistic view, researchers prefer this setting over others for its availability of linguistic and cultural resources, believed to be instrumental components in addressing academic needs of bilingual deaf and hard of hearing children. While this perspective is valid and does enable researchers to understand certain phenomena more fully, more than 70% of the nation's deaf and hard of hearing children are not served in the residential setting (GRI, 2005; Johnson & Cohen, 1994; Schildroth & Hotto, 1996). Implementation in other settings (e.g., public and charter schools) must also be examined.

Quantitative investigation regarding the impact of ASL/English bilingual education in public schools is virtually nonexistent in the literature. This may be due to the misconception that public schools do not or will not use ASL. Given the changes in curriculum at many teacher training institutions in the past decade, requirements of the Council of Education of the Deaf, state certification examinations for educators of the deaf, and the growing number of universities offering ASL as a foreign language, the field may simply be overlooking the number of public school programs with skilled users of ASL. We cannot be certain.

The field looks to the Gallaudet Research Institute (GRI) to keep it abreast of current educational trends, but one might notice that the regional and national summary reports do not list ASL or ASL/English bilingual education as a reporting option (GRI, 2005). Under "communication mode used primarily in teaching," the options are limited to "speech only, sign and speech, sign only, cued speech, and other" (GRI, 2005). The assumption might be that programs using ASL would fall under the "sign only" category, and that those using forms of Simultaneous Communication might fit best under the label "sign and speech." However, ASL/English bilingual education has a fundamental emphasis on oral skill development: oracy (listening, speaking, and speechreading) as a key component within the bilingual framework, along with signacy

**Table 1**
Investigations That Present Empirical Data on ASL/English Bilingual Methodology

| *Study* | *N* | *Results* |
|---|---|---|
| Andrews, Ferguson, Roberts, & Hodges (1997) | 7 | Bilingual-bicultural programming had a significant positive impact on students in prekindergarten through first grade in a number of areas, including basic concepts, auditory comprehension, picture vocabulary, English grammar, reading, ASL competency, English writing tasks, and mathematics. |
| Hoffmeister (2000) | 78 | A relationship between ASL knowledge and specific reading skills was observed. Students with extensive ASL exposure scored better on ASL and reading comprehension tasks than those with limited exposure to ASL. ASL users also outperformed users of Manually Coded English on MCE tasks. |
| Kuntze (2004) | 91 | Levels of ASL passage comprehension had significant predictive power regarding English passage comprehension. Significant differences were shown between the ASL and English literacy skills of deaf children of deaf parents and the skills of deaf children of hearing parents. |
| Li (2005) | 15 | Student retelling scores and understanding of science concepts significantly increased with the use of preview-view-review, a bilingual technique. Deaf bilingual students experienced statistically significant gains compared to hearing bilingual students. |
| Mayberry (1989, 1999); Mayberry, Chamberlain, Waters, & Doehring (1999) | 48 | Statistically significant relationships were found between ASL and English story comprehension measures, ASL story comprehension and SAT-9 Reading subtest scores, and ASL sentence span and English story comprehension. |
| Moores et al. (1987); Moores & Sweet (1990) | 130 | Nonsignificant relationships were found between ASL language proficiency interviews and a composite of five standardized English reading measures for students ages 16–18 years. |
| Nover, Andrews, Baker, Everhart, & Bradford (2002) | 122 | It was found that students with ASL/English bilingually trained teachers had significantly improved SAT-9 English Vocabulary and Language subtest scores. Younger students (ages 8–12 years) scored significantly higher than the national norms on the SAT-9 English Vocabulary, Reading Comprehension, and Language subtests. Parental hearing status influenced performance only for older students. |
| Padden & Ramsey (1998) | 31 | It was found that ASL test results correlated with reading comprehension, regardless of parental hearing status. A relationship was discovered between reading skills and ASL sentence order, ASL verb agreement, ASL sentence imitation, fingerspelling, and initialized signs. |
| Prinz (1998); Prinz & Strong (1998); Strong & Prinz (1997) | 155 | Statistically significant correlations between ASL proficiency and English literacy were found. The researchers observed that students with deaf mothers outperformed students with hearing mothers only on ASL and English tasks when the hearing mothers had low ASL ability. |
| Singleton, Supalla, Litchfield, & Schley (1998) | 80 | It was found that extent of exposure to ASL enhances ASL ability. After age 9 years, highly ASL-fluent deaf children of hearing parents were outperforming less ASL-fluent peers on several English writing tasks. |
| Smith (2006) | 123 | Students with higher English reading comprehension scores on the SAT-9 also scored better on ASL phonology, morphology, syntax, semantic, and pragmatic tasks on the Test of ASL–Revised. This relationship was statistically significant. |

*Notes.* ASL, American Sign Language. SAT-9, Stanford Achievement Test, ninth edition.

(receptive and expressive ASL, fingerspelling/finger reading) and literacy (reading, writing, and typing) (Nover, 2005; Nover et al., 1998). Contrary to common misconception, the approach does not ignore oracy; rather, it supports instructional delivery that separates languages, thereby preserving the complete linguistic code of any language used in the classroom.

The regional and national summary reports simply do not present their data in a way that enables readers to accurately interpret the number of programs using ASL or bilingual methods.

All we know is that 39.5 % of students are exposed to "speech and sign" and 11.2% to "sign only"; readers must guesstimate the amount of ASL usage among these 50.7% of deaf students using some type of manual system. Implications of this type of reporting for public schools under pressure to address oral language skills as a result of individualized education program (IEP) planning are confusing at best. We cannot assume that public schools are not open to the option of ASL/English bilingual education, especially considering the state and federal pressure to improve student outcomes.

The debate over the efficacy of using ASL/English bilingual methods in public school settings has been relegated, then, to opinion more than fact. In the study by Padden and Ramsey (1998), only 13 students were being served in the public school setting under consideration; in a study by Singleton, Supalla, Litchfield, and Schley (1998), only 16 were being served. Andrews and colleagues (1997) solely examined the methodological impact on public school children served in a regional day school program in Bryan, TX. The study held promise, but, with only 7 participants, was too small to be generalized.

Therefore, the purpose of the present study was to investigate the use of ASL/English bilingual education in a public school serving deaf and hard of hearing children. We explored two important issues: the general viability of implementation in a public school setting and the efficacy of the methodology when used with public school students. The study was not without limitations, as the sample was small ($N$ = 25). As with previous studies, generalization of this study must be done with caution. Nevertheless, it provides empirical data that can assist researchers in understanding potential implications of implementation in the public school setting.

## Methodology

We observed a public school program serving deaf and hard of hearing students in the Midwest over a 1-year period. Quantitative data relative to reading comprehension achievement were collected and analyzed. Interviews with teachers and staff helped us understand program design and instructional practices. In our analyses, we sought to understand the viability of ASL/English bilingual implementation and the efficacy of implementation as shown by student outcomes.

## Limitations of the Study

### Defining the Pedagogical Practice Under Consideration

It is necessary to note that researchers are well aware of the silent debate that persists in the field over whether the descriptor *ASL/English bilingual* should be used over the older term *bilingual-bicultural.* Some experts might argue that the newer label is reserved for programs that have experienced specific professional development training. Unfortunately, much of the leading ASL/English bilingual professional development training provides limited opportunities for public school participation. We recognized the need to improve pedagogical practices through rigorous, formal training for both preservice and inservice teachers. Nevertheless, knowledge is a vast and complex entity, attainable by those who seek it regardless of the degree of formality of the means of reception. Therefore, adherence to ASL/English bilingual education is loosely interpreted within this particular study, which could be seen as a clear limitation. For the purposes of the present article, the larger category of methodology that promotes the use of both ASL and English is given consideration. The study focused on the actual methods used in the program, not the result of specific training protocols.

### Sample Selection

In 2004, the school program from which we drew the study sample had a total population, preschool through 12th grade, of nearly 50 students. But not all of these students were included in the research sample. There were several grounds for exclusion. First, students with normal hearing were removed from consideration ($n$ = 1). Students who were hard of hearing or hearing impaired who did not use ASL in any capacity and whose performance could not be linked to the methodology under investigation were removed ($n$ = 8). Children with severe cognitive deficits or multiple severely handicapping conditions served primarily outside of deaf education classrooms were removed ($n$ = 3). Students below the second-grade level who did not have sufficient language to participate in standardized testing that would yield scores within a measurable range could not be included in the analyses ($n$ = 8). Students whose parents did not give consent were not included ($n$ = 3). The resulting sample totaled 25 students. Sample size, then, should be recognized as a clear limitation of the study, and results should be carefully interpreted in attempts to generalize findings.

### Use of the Reading Comprehension Subtest

Use of the Reading Comprehension subtest of the Stanford Achievement Test, ninth edition (SAT-9), should also be considered a limitation of the present study. (For further discussion, see below under "Instrumentation").

**Table 2**
Demographic Characteristics of the Sample

| | *Characteristic* | *n* |
|---|---|---|
| IQ | Below average (84 or below) | 2 (8%) |
| | Average (85–109) | 8 (32%) |
| | Above average (110+) | 2 (8%) |
| Etiology | Unknown | 11 (44%) |
| | Hereditary | 5 (20%) |
| | Genetic with syndromes | 2 (8%) |
| | Complications during pregnancy | 2 (8%) |
| | Prematurity | 1 (4%) |
| | Childhood sickness | 4 (16%) |
| Disabilities | Learning disability | 2 (8%) |
| Ethnicity | White | 11 (44%) |
| | Hispanic | 1 (4%) |
| | Asian | 3 (12%) |
| | American Native | 7 (28%) |
| Participation in free/reduced-price | Yes | 5 (20%) |
| lunch program | No | 16 (64%) |
| Primary language of the home | ASL | 2 (8%) |
| | Spoken English | 19 (76%) |
| | Other spoken language | 4 (16%) |
| Other home languages | ASL or other signed communication | 20 (80%) |
| | Spoken English | 25 (100%) |
| Familial hearing status | Mother deaf | 20 (80%) |
| | Siblings deaf | 7 (28) |
| Parent signing skills | None/beginner | 12 (48%) |
| | Intermediate/advanced | 12 (48%) |
| Level of parental involvement | Low | 4 (16%) |
| | Medium/high | 20 (80%) |
| Age at onset | Birth–1 year | 22 (88%) |
| | After age 2 years | 3 (12%) |
| Degree of hearing loss | Profound (91+ dB) | 22 (88%) |
| | Severe (70dB–89dB) | 1 (4%) |
| | Mild/moderate (69 dB or below) | 2 (8%) |
| Assistive listening device used | Hearing aids (1 or 2) | 12 (48%) |
| Student grade levels, 2004 | 2 | 1 (4%) |
| | 5 | 3 (12%) |
| | 6 | 5 (20%) |
| | 7 | 4 (16%) |
| | 8 | 1 (4%) |
| | 9 | 7 (28%) |
| | 11 | 3 (12%) |
| | 12 | 1 (4%) |

*Notes.* *N* = 25. Demographic data for some characteristics, such as IQ, ethnicity, and participation in free/reduced-price lunch programs, were not available for all students. ASL, American Sign Language.

## Sample

The sample consisted of 25 deaf and hard of hearing children served in a public school setting (DeLana, 2004). The students varied individually in terms of IQ, etiology of hearing loss, and other demographic characteristics (see Table 2).

## Instrumentation

The SAT-9 Reading Comprehension subtest was used to determine levels of reading comprehension. While the SAT-9 has its limitations, including some language bias against deaf and hard of hearing children, it is considered the standard yardstick for deaf education due to the establishment of deaf and hard of hearing norms by GRI (Holt et al., 1997). The use of this instrument, while standard, should nonetheless be recognized as a limitation of the present study.

## Data Collection

Longitudinal SAT-9 data spanning 1997 to 2004 were analyzed to assess student outcomes. Background demographic data on each student were gathered. Other descriptive data regarding teacher and support staff, program design, classroom methods, and curriculum were gathered by observation and interviews with teachers and staff.

## Data Analysis

Data analysis sought to ascertain viability—how well the program implemented the methodology—and efficacy—how student outcomes were affected by the methods used. Consequently, analysis are broken into four sections: (a) program design and review of instructional practices, (b) descriptive statistics, (c) correlational analysis, and (d) causal-comparative analysis.

## Program Design and Review of Instructional Practices

The K–12 program was located in a suburban school district in the Midwest and typically accepted transfer students from more than 10 surrounding rural districts. Educational continuum options ranged from full-time self-contained settings to full-time mainstreaming in regular classes, depending on student need, academic skills, and IEP development in accordance with the Individuals With Disabilities Education Act.

In 2004, the program employed six teachers. One teacher was assigned at each respective level: combined preschool and kindergarten, lower elementary (grades 1–3), upper elementary (grades 4–5), middle school (grades 6–8), intermediate high (grades 9–10), and senior high (grades 11–12). Teachers varied in terms of years of teaching experience, formal and informal training in regard to ASL/English bilingualism, teaching style, and ASL fluency. All teachers held undergraduate degrees in deaf education; additional attributes are listed in Table 3.

Support personnel also represented a key component of the program design. They consisted of eight interpreters and four paraprofessionals. Interpreters were required to take the Quality Assurance Screening Test (QAST), which rates interpreters on a 5-point scale, or to hold certification from the Registry of Interpreters (RID) or the National Association of the Deaf (NAD). Data on the interpreters' levels of qualification are provided in Table 4. Two of the four paraprofessionals were deaf ASL users working with children in the lower elementary grades. Of the two hearing paraprofessionals, one worked in the elementary program and the other in the middle school.

The deaf education program reported a 10-year history of using both ASL and English in the classroom. The district's communication philosophy indicated the use of ASL as the primary language of instruction, with a strong emphasis on English development through literacy. Per this written guideline, teachers were discouraged from using their voices when signing ASL during classroom instruction. The use of Simultaneous Communication, including any variation of communication systems such as Signed English, Manual Coded English, Cued Speech, and contact/pidgin signing, was to be avoided during all large-group instruction in the deaf education classrooms. Purposeful code switching consistent with methodological principles (Baker, 2001; CAEBER 2002; Jacobson, 1990) was recommended. When we observed use of Simultaneous Communication, it was limited to one-to-one or small-group activities that supported hard of hearing students' transitioning to ASL as a second language. Program guidelines strictly advised against these practices for all other students, and we observed adherence to this philosophy.

An emphasis on appropriate language modeling, register adjustment to meet specific student needs, and evidence of ASL proficiency on the part of all deaf education staff was observed to be of high priority in school policies and curricula. The program also incorporated an extensive curriculum on sign language interpreter usage, which included the explicit teaching of roles and responsibilities of students and interpreters, daily monitoring, monthly reporting, goal development, and IEP linkages. Consistent programmatic bilingual language planning that incorporated status, corpus, and acquisition planning (Nover, 2005) was also observed to take place in deaf education staff meetings. (Interestingly, teachers and support staff were unfamiliar with those specific planning descriptors.)

**Table 3**
Attributes of Teaching Staff

| *Teacher attribute* | *n* |
|---|---|
| More than 5 years' experience with ASL/English methodology | 5 (83%) |
| More than 5 years' service in the school district | 4 (67%) |
| B.A./B.S. in deaf education | 6 (100%) |
| M.A./M.S. (any field) | 4 (67%) |
| Formal training in ASL/bilingual methods (ASL/English bilingual education training projects, extensive college training) | 2 (33%) |
| Informal training in ASL/bilingual methods or linguistics (in-service, workshops, guest speakers, etc.) | 6 (100%) |
| Adjunct faculty at colleges or universities | 2 (33%) |
| Had Deaf teachers | 1 (17%) |
| Rochester Institute for the Deaf certification | 2 (33%) |
| Certification/quality test measures of ASL proficiency | 6 (100%) |

*Notes.* *N* = 6. ASL, American Sign Language.

**Table 4**
Interpreter Qualifications

| *Certification level* | *n* |
|---|---|
| QAST Level I | 1 (13%) |
| QAST Level II | 1 (13%) |
| QAST Level III | 3 (38%) |
| QAST Level IV | 2 (25%) |
| RID CI/CT | 1 (13%) |

Notes. *N* = 8. QAST, Quality Assurance Screening Test. RID, Registry of Interpreters. CI, certified interpreter. CT, certified translator.

Creating a culturally supportive environment seemed to be highly valued. Extensive staff development training occurred between deaf education and regular education staff. Teachers and administrators described concerted efforts to hire and retain deaf staff, although a critical shortage of certified deaf teachers existed in the state. School sites incorporated cultural information into the training of building staff to assist coworkers in maximizing relationships with deaf staff and students. Schools went beyond minimum accessibility requirements for deaf teachers, installing videophones in administrative offices and classrooms to enable better communication.

Cooperative arrangements were made with other areas of special education, and consistent collaboration with the postsecondary community was evident. Additionally, deaf and hard of hearing students were readily involved in extracurricular activities, meaningful relationships with hearing peers were fostered, and organized school clubs that promoted Deaf history and culture were available for both deaf and hearing students. The comprehensive integration of deaf and hard of hearing students into the student body was an element of the program goals. Accessibility through technology was valued. Strong administrative support for program needs and well-defined procedural structures were prevalent.

Another unique feature of this program was the commitment to collaboration. K–12 deaf education staff regularly engaged in *vertical team* efforts to improve curriculum and instruction. Vertical teaming included collaboration by all teachers at all levels, ensuring that the *vertical path* that students took as they progressed from one grade to another was aligned and effective. This created an information exchange relationship that was apparent in the standardization of and accountability for certain practices, especially in regard to language and instructional methods.

For example, all teachers were expected to use literature-based curricula, follow a grade-appropriate state framework for curricula, employ whole language ideologies, and address multiple learning styles. All teachers were expected to include specific reading activities in all content areas daily. These included language experience stories; independent, guided, and shared reading and writing; use of journals and logs; writers' workshops; ASL storytelling; and research reading and writing, all as outlined by Fernandes (1997).

Certain bilingual practices were also recommended in these vertical team meetings, and we observed their implementation. These included language separation during literacy activities (Jacobson, 1990), facilitation of metalinguistic awareness, the use of contrastive linguistic models for grammar instruction (DeLana & Skarp, 2004), and bridging (Schimmel, Edwards, and Prickett, 1999). Certain instructional strategies also were frequently observed, but not all teachers were familiar with the actual academic terms for these activities. These included free and literal translation (Larson, 1999), chaining (Humphries & MacDougall, 2000; Padden & Ramsey, 1998), sandwiching (Blumenthal-Kelly, 1991), preview-view-review (Y. Freeman & D. Freeman, 1998), concurrent approaches (Jacobson, 1990), and translanguaging (Baker, 2001). All of these types of activities, used to foster social and academic dual-language skills, were discussed in vertical team meetings. Additionally, collaboration allowed the teachers to pool their resources, ensuring multiple curricular options.

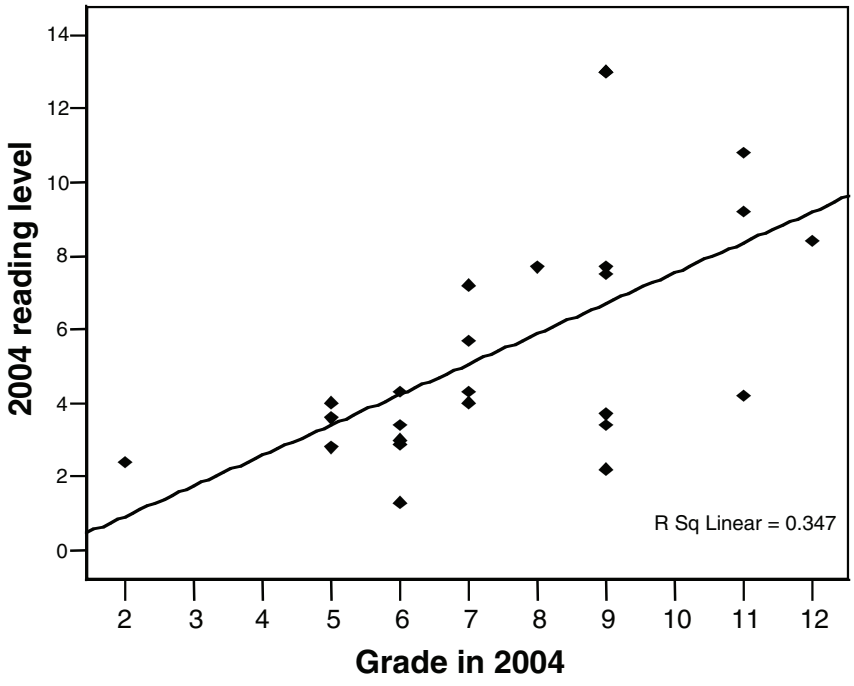
## Descriptive Statistics

Results from the SAT-9 Reading Comprehension subtest were used to determine how student outcomes were being affected by the program design and instructional methods used. As expected, all scores increased with age. Reading proficiency for each student and for the collective group improved annually over the 7 years of data. For elementary school children ($n$ = 4), steady gains were experienced from age 8 years onward. For students in middle school ($n$ = 10) and high school ($n$ = 11), the greatest gains occurred after the age of 12 years. The plateau effect that often occurs with deaf and hard of hearing students in the middle school years did not occur in our sample. In contrast, older students made gains during middle school. Furthermore, certain secondary school students scored at levels that met and exceeded grade-level expectations for their hearing counterparts. Twenty-four percent of the students ($n$ = 6) read at grade level in 2004, and 72% ($n$ = 18) were within two grade equivalencies of yielding outcomes at grade level. Figure 1 provides a visual depiction of the distribution of these 2004 student scores.

To accurately interpret these data, a frame of reference for how the sample might perform in comparison to other deaf students nationally was needed. We compared the 25 students' mean standard scores with those of the GRI SAT-9 deaf and hard of hearing norming sample (Holt et al., 1997). The comparison scores by age between the two research samples are provided in Table 5. The intent to provide a frame of reference for understanding student outcomes, not a comparative analysis.

Score progression was also evaluated. Individual score progression for almost every student was equal to ap-

**Figure 1**
Scatterplot of 2004 Reading Comprehension Subtest Scores




proximately one grade equivalency per year after age 8 years. These reading grade level equivalencies were not equal to a student's actual academic grade level in most cases. This finding might suggest that delays in early language provide a late starting point for achievement, thereby impeding a child's ability to attain grade-level performance before exiting high school.

Figure 2 depicts the score progression from 2003 to 2004 when student data were organized by grade for those students with test scores for both years. For example, the mean standard score for all eighth-grade students in 2003 yielded a grade equivalency of 5.9 (interpreted as fifth grade, ninth month). The mean standard score for the same group in 2004, when they were ninth graders, yielded a grade equivalency of 7.2 (seventh grade, second month). This standard score gain, then, represents more than a year's growth for this group of students.

An interesting finding related to score progression was the differences between the scores of older students and those of younger students. The upper high school students (grades 10–12, $n = 4$) had elementary school scores that were lower than the younger children's elementary school scores, which resulted in depressed scores in later grades. To facilitate the interpretation of data, we interviewed classroom teachers, hoping to gain possible explanations for this phenomenon.

Teachers reported several possible factors. For one, they suggested that these younger students may have received more dual language exposure to early native language models since the district started hiring more deaf teachers and aides after the implementation of ASL use around 1994. They may have benefited from smaller class size resulting from the addition of staff, or could have benefited from the size of the deaf and hard of hearing student population, growing toward critical mass. Additionally, the teachers explained that under the new methodology and leadership, student achievement was being monitored, instruction was consistently evaluated, and instructional modifications followed. They believed that instructional practices, and the overall quality of their program, had improved over time. Consequently, they posited, student achievement was improving. Despite the apparent logic of these assertions, quantitative analysis could not substantiate any of them.

Table 5

Study Sample`s Outcomes Compared to Those of the SAT-9 Deaf and Hard of Hearing Norming Sample

| *Age (years)* | *GRI norming sample, 1997*[a] | | | *Public school, 2004 (study sample)* | | | *Public school, 1997–2004 combined data (study sample)* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *N* | *M* | *SD* | *N* | *M* | *SD* | *N* | *M* | *SD* |
| 8 | 270 | 524.1 | 46.43 | 1 | 563.00 | 0.00 | 10 | 524.80 | 49.05 |
| 9 | 358 | 538.3 | 49.50 | n/a | n/a | n/a | 11 | 560.00 | 34.04 |
| 10 | 440 | 549.7 | 52.20 | 2 | 604.50 | 24.75 | 9 | 565.89 | 45.17 |
| 11 | 408 | 575.9 | 53.90 | 2 | 633.50 | 30.41 | 14 | 583.64 | 65.04 |
| 12 | 442 | 578.1 | 57.00 | 3 | 619.67 | 10.69 | 16 | 609.88 | 49.92 |
| 13 | 476 | 593.7 | 59.10 | 4 | 634.75 | 33.09 | 15 | 627.13 | 41.55 |
| 14 | 778 | 601.2 | 57.90 | 2 | 611.00 | 89.10 | 11 | 637.64 | 47.96 |
| 15 | 497 | 614.0 | 56.40 | 5 | 673.80 | 36.35 | 7 | 644.57 | 43.92 |
| 16 | 513 | 615.3 | 55.70 | 1 | 607.00 | 0.00 | 3 | 619.00 | 31.75 |
| 17 | 508 | 621.4 | 65.90 | 2 | 697.50 | 6.36 | 3 | 693.00 | 9.00 |

*Notes.* SAT-9, Stanford Achievement Test (9th ed.). GRI, Gallaudet Research Institute.
[a] Holt et al. (1997).

To ascertain which students were being the most successful, data from high and low gainers were analyzed. For this purpose of this research, a high gainer was defined as a student whose annual progression exceeded the standard deviation of the mean annual progression of the group. A low gainer, then, was a student whose annual progression was less than the mean annual progression of the group, as defined by the lower limit of the standard deviation of the group mean. Through identification of students and corresponding background variables, this interaction was revealed. Figure 3 depicts the bell curve distribution of students' average annual mean deviation scores.

Several consistencies were noted within the group of low gainers ($n$ = 3). The etiology of all low gainers was nongenetic and non–syndrome related. All of these students had profound hearing losses and were prelingually deaf. The home language of all three was a spoken language. None of the parents of students in this group possessed sign skills beyond the beginner level. Regarding performance, each student experienced score progression over time. In younger years, reading comprehension scores were very low for this group, resulting in depressed scores over time.

Consistencies existed within the group of high gainers ($n$ = 6) as well. Five of these six students were prelingually deaf and had profound hearing losses, as was the case with all three of the low gainers. None of the high gainers participated in the free/reduced-price lunch program, which could imply that they were from higher socioeconomic groups. Additionally, each had at least one parent with intermediate to advanced signing skills, and in each case the parents were rated as having a medium or high level of involvement. After age 10 years, these students improved at least one grade equivalency annually. Three of these students scored above grade level during the last year of testing. These students were able to be competitive with, or even surpass, their hearing counterparts.

**Figure 2**
Grade Equivalency Progression, 2003 to 2004

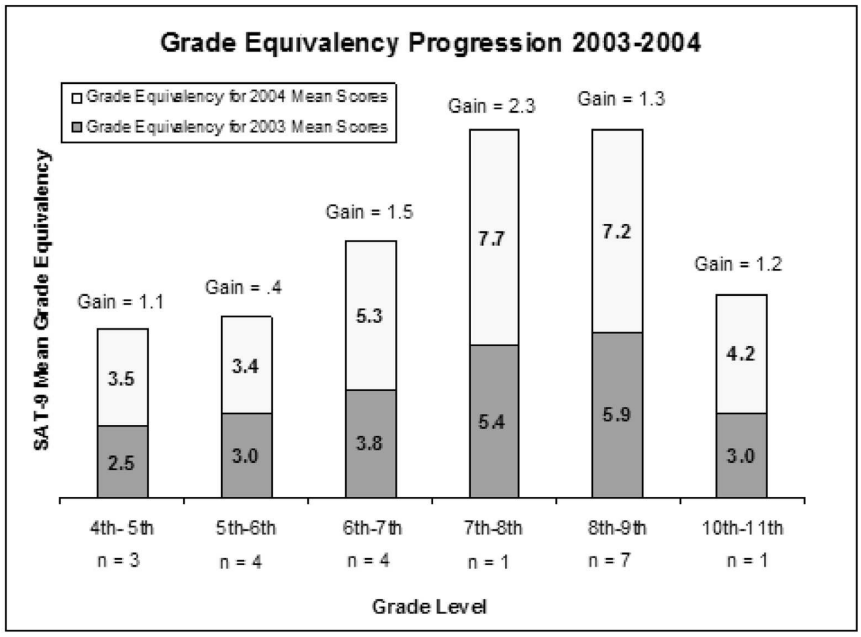
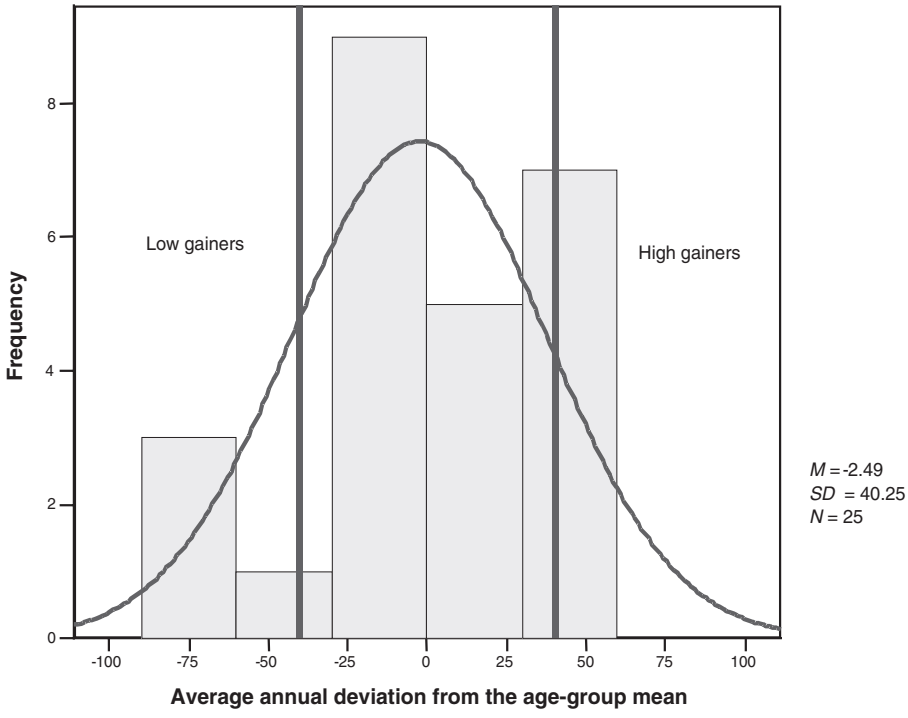



**Figure 3**
Distribution of the Sample's Average Annual Mean Deviation Scores



## Correlational Analysis

Correlational analysis was conducted in an attempt to identify relationships between certain background variables and achievement, since variable patterns were identified in the groups of high and low gainers. The phi coefficient of correlation, Φ, was calculated for nominal data. The Pearson product-moment correlation coefficient, *r,* was calculated for scaled data. These coefficients of correlation were used to determine direction, strength, and significance of any relationship between specific variables and student outcomes.

Nominal data were arranged as 2 x 2 dichotomous pairs, with the first pair representing the variable in question and the second pair being positive or negative deviations from the mean of the student's age group (see Table 6). Evaluation of the phi coefficient for eight variables revealed that relationships did exist between student outcomes and each variable. None of these relationships were statistically significant at a 95% confidence interval ($p < .05$).

Pearson's *r* was used to ascertain whether a relationship existed between years of ASL usage and student outcomes. Investigation into this area was a direct result of teacher input. Several teachers noted that they instinctively believed that their students with stronger ASL skills outperformed other students. Unfortunately, measurement of ASL skill was beyond the scope of the present study. Data regarding years of ASL usage were readily available and could be evaluated. Pearson's *r* was the appropriate measure, as student outcomes (2004 standard scores) and years of ASL usage were both scaled values. Consistent with teacher speculation, a statistically significant relationship existed between years of ASL usage and the 2004 reading comprehension test scores, $r(22) = .508$, $p < .05$. Interpreted, this means that years of ASL usage was able to predict reading comprehension achievement with 25% accuracy. While this relationship may be statistically significant, at this level of predictive ability the interpretation must not be misconstrued. Additionally, this analysis does not speak to the extent or quality of exposure to ASL, and it can be assumed that both factors influence variation.

**Table 6**
Arrangement of Dichotomous Pairs and Value of Phi (Φ)

| *Variable groups* | | *Deviation groups* – | + | *Value of phi (Φ)* |
|---|---|---|---|---|
| Presence of a deaf family member | Yes | 3 | 4 | .114 |
| | No | 10 | 8 | |
| Home language | Spoken English | 13 | 10 | .307 |
| | American Sign Language | 0 | 2 | |
| Parental sign skills | None/beginner | 8 | 5 | .199 |
| | Intermediate/advanced | 5 | 7 | |
| Parental involvement level | Low | 3 | 1 | .224 |
| | Medium/high | 9 | 11 | |
| Socioeconomic status: Uses free/reduced-price lunch program | Yes | 3 | 2 | .103 |
| | No | 9 | 10 | |
| Age at onset | Birth–age 2 years | 12 | 10 | .138 |
| | After age 2 years | 1 | 2 | |
| Level of hearing loss | Moderate/severe | 1 | 2 | .138 |
| | Profound | 12 | 10 | |
| Uses an assistive listening device | No | 2 | 3 | –.108 |
| | Yes | 9 | 8 | |

This finding is interesting, nevertheless. It is also consistent with previous research conducted by Jim Cummins regarding his Theory of Language Interdependence (Cummins, 1976, 1979, 1981, 2003). Cummins stated that students move beyond basic interpersonal communication skills (BICs) and develop cognitive academic language proficiency (CALP) after 5 or more years of exposure to a language. If CALP develops in the first language, then second-language acquisition occurs more easily. Interestingly, all of the participants in the present study had 2 or more years of ASL usage, with 84% having 5 or more years. According to Cummins's theories, these students may have experienced sufficient exposure to acquire cognitive academic language proficiency in ASL, thereby facilitating English-language acquisition. Levels of CALP were not measured in the present study; therefore, findings do not allow for empirical certainty.

## Causal-Comparative Analysis

While our correlational analyses had the goal of determining the existence of relationships, we were most interested in determining causation. In past studies, a number of variables have been shown to influence student achievement (Basil & Quigley, 1977; Luetke-Stahlman, 1990; Moores & Sweet, 1990; Padden & Hansen, 2000). Therefore, our analysis sought to determine causality, ascertaining which variables, if any, acted as facilitating agents in regard to reading achieve-

ment. Independent sample *t* tests were used to determine whether differences in mean scores between groups were statistically significant (see Tables 7 and 8).

### *Presence of Deaf Family Members (Parents or Siblings)*

Students without deaf family members experienced greater gains in annual standard scores than students with deaf family members (see Table 7). Standard scores for those with deaf family members deviated more positively from the mean score for their age group annually, though (see Table 8). Nevertheless, no significant effect for the presence of deaf family members, regarding average annual standard score increase, $t(20) = 1.002$, $p < .05$, or average annual deviations from age-group means, $t(23) = .680$, $p < .05$, could be identified.

### *Home Language*

Students with spoken English as the primary home language experienced slightly greater gains in annual standard scores than students whose primary home language was ASL (see Table 7). Interestingly, though, students who used ASL at home deviated more positively from the mean score for their age group annually (see Table 8). A closer review of individual data showed that students with home ASL had higher scores beginning in the elementary grades and extending through the secondary grades. The students without the same type of home language exposure started farther behind, but made greater gains annually. No significant effect for the home language, regarding either average annual standard score increase, $t(20) = .486$, $p < .05$, or average annual deviations from age-group means, $t(23) = 1.811$, $p < .05$, was found, however.

**Table 7**

Independent Samples *t* Test Results: Average Annual Standard Score Increase

| *Variable groups* | | *n* | *M* | *SD* | *df* | *t* |
|---|---|---|---|---|---|---|
| Presence of a deaf family member | Yes | 7 | 21.78 | 8.92 | 20 | 1.002 |
| | No | 15 | 31.98 | 25.94 | | |
| Home language | Spoken English | 20 | 29.48 | 23.48 | 20 | 0.486 |
| | American Sign Language | 2 | 21.31 | 1.45 | | |
| Parental sign skills | None/beginner | 11 | 31.26 | 28.81 | 20 | 0.522 |
| | Intermediate/advanced | 11 | 26.22 | 13.99 | | |
| Parental involvement level | Low | 4 | 26.46 | 12.89 | 19 | 0.234 |
| | Medium/high | 17 | 29.49 | 24.84 | | |
| Socioeconomic status: Uses free/reduced-price lunch program | Yes | 5 | 32.53 | 21.17 | 19 | 0.398 |
| | No | 16 | 27.78 | 21.17 | | |
| Age at onset | Birth–age 2 years | 19 | 30.40 | 23.34 | 20 | 0.876 |
| | After age 2 years | 3 | 18.22 | 10.17 | | |
| Level of hearing loss | Moderate/severe | 3 | 18.00 | 7.17 | 20 | 0.895 |
| | Profound | 19 | 30.43 | 23.45 | | |
| Uses an assistive listening device | No | 19 | 30.43 | 23.45 | 17 | 0.323 |
| | Yes | 4 | 23.79 | 13.47 | | |
| Ethnicity | White | 9 | 32.51 | 30.20 | 17 | 0.393 |
| | Nonwhite | 10 | 28.18 | 16.57 | | |
| IQ | 80–100 | 6 | 21.13 | 10.12 | 8 | 0.300 |
| | >100 | 4 | 22.74 | 3.87 | | |

**Table 8**

Independent Samples *t* Test Results: Average Annual Deviation From Age-Group Means

| | *Variable groups* | *n* | *M* | *SD* | *df* | *t* |
|---|---|---|---|---|---|---|
| Presence of a deaf family member | Yes | 7 | 6.39 | 47.53 | 23 | 0.680 |
| | No | 18 | -5.94 | 38.01 | | |
| Home language | Spoken English | 23 | -6.60 | 39.28 | 23 | 1.811 |
| | American Sign Language | 2 | 44.75 | 9.41 | | |
| Parental sign skills | None/beginner | 13 | -16.12 | 43.18 | 23 | 1.849 |
| | Intermediate/advanced | 12 | 12.28 | 32.29 | | |
| Parental involvement level | Low | 4 | -42.68 | 59.69 | 22 | 2.380* |
| | Medium/high | 20 | 6.12 | 32.54 | | |
| Socioeconomic status: Uses free/reduced-price lunch program | Yes | 5 | -19.02 | 44.58 | 22 | 1.043 |
| | No | 19 | 2.46 | 40.12 | | |
| Age at onset | Birth–age 2 years | 22 | -5.32 | 41.26 | 23 | 0.949 |
| After age 2 years | 3 | 18.23 | 28.92 | | | |
| Level of hearing loss | Moderate/severe | 3 | 13.67 | 27.52 | 23 | 0.781 |
| Profound | 22 | -4.83 | 41.61 | | | |
| Uses an assistive listening device | No | 5 | 6.08 | 18.71 | 17 | 0.323 |
| | Yes | 17 | -6.04 | 46.75 | | |
| Ethnicity | White | 11 | 1.52 | -10.55 | 20 | 0.677 |
| | Nonwhite | 11 | -10.55 | 43.77 | | |
| IQ | 80–100 | 8 | -17.14 | 44.16 | 10 | 1.373 |
| | >100 | 4 | 19.23 | 41.02 | | |

*Denotes statistical significance at a 95% confidence interval, p < .05.

### *Parental Sign Skills*

Students with parents who were rated by teachers as having sign skills at the none-to-beginner level experienced greater annual standard score increases than other students (see Table 7). Students with parents who had intermediate to advanced sign skills experienced scores that more positively deviated from the mean (see Table 8). This phenomenon is consistent with the findings related to home language. Students whose parents had intermediate to advanced skills had higher scores beginning in the elementary grades and extending through the secondary grades. The students with parents who had weaker skills started farther behind, but made greater gains annually. These differences were not statistically significant regarding average annual standard score increase, $t(20) = .522$, $p < .05$, or average annual deviations from age-group means, $t(23) = .1.849$, $p < .05$.

### *Level of Parental Involvement*

Students with parents who were rated by teachers as having medium or high levels of involvement outperformed students with parents who were not rated as highly. These students experienced greater improvements in annual standard scores as well as more positive deviations from their age-group means (see Tables 7 and 8). While there was no significant effect regarding average annual standard score increase, $t(19) = .234$, $p > .05$, there existed a statistically significant difference between groups, $t(22) = 2.380$, $p > .05$. This finding suggests that parental involvement acted as a facilitating factor for reading development within the sample.

### *Socioeconomic Status*

Students from lower socioeconomic groups experienced greater annual improvement in standard scores (see Table 7), but deviated more negatively from the mean compared to students from the other group (see Table 8). These students tended to begin elementary school farther behind but made greater annual gains. These gains were still not enough for them to perform at the same level as other students. Even so, these difference were not statistically significant for annual score increases, $t(19) = .398 > .05$, nor for average annual deviations from the mean, $t(22) = 1.043$, $p > .05$.

### *Age at Onset*

Prelingually deaf students experienced greater annual gains per year than postlingually deafened students (deafened after age 2 years; see Table 7). Students with later onset experienced greater annual deviations from the mean (see Table 8). These postlingually deafened students had higher scores beginning in the elementary school years and extending through the secondary school grades. The prelingually deaf students started farther behind but made greater annual gains. No significant effect for age at onset was identified for annual gains, $t(20) = .876$, $p > .05$, or for average annual deviations from the age-group mean, $t(23) = .949$, $p > .05$.

### *Level of Hearing Loss*

Profoundly deaf students experienced greater annual gains per year than those with moderate to severe hearing loss (see Table 7). Profoundly deaf students did not deviate as positively from the mean as the group with moderate to severe hearing losses, however (see Table 8). Profoundly deaf students started farther behind, but made greater gains annually. No significant effect could be found, however, for either annual gains, $t(20) = .895$, $p > .05$, or average annual deviations from the age-group mean, $t(23) = .781$, $p > .05$.

### *Absence or Presence of Assistive Listening Devices*

Students who used personal assistive listening devices (e.g., one or two hearing aids or a cochlear implant) experienced slightly smaller increases in annual standard scores (see Table 7). Students who chose not to use these devices at all deviated more positively from the mean score for their age group annually (see Table 8). Simply put, students without personal assistive listening devices had higher scores beginning in the elementary grades and maintained their growth through the secondary grades. The students with personal assistive listening devices started farther behind but made greater annual gains. These differences, while interesting, were not found to be statistically significant for annual gain $t(17) = .323$, $p > .05$, or for average annual deviations from the age-group mean, $t(17) = .323$, $p > .05$.

### *Ethnicity*

Nondiverse (white) students experienced greater improvements in annual standard scores than diverse (i.e., nonwhite) students (see Table 7). Additionally, nondiverse students experienced more positive deviations from their age-group means (see Table 8). These mean score differences were not statistically significant for annual score increase, $t(17) = .393$, $p > .05$, or for annual deviations from the age-group mean, $t(20) = .677$, $p > .05$.

### *IQ Score*

Students with IQ scores over 100 experienced greater improvements in annual standard scores (see Table 7), as well as more positive deviations from their age-group means (see Table 8),

than other students in the sample. No statistically significant difference was identified for annual score increase, $t(8) = .300$, $p > .05$, or for annual deviations from the age-group mean, $t(10) = 1.373$, $p > .05$. IQ scores were not available for most students; this could have confounded the analysis.

It seems that factors such as low IQ, specific etiologies, factors related to low socioeconomic status, spoken home language, low levels of parental involvement, and weak parental signing skills acted as impeding agents, with slight, nonsignificant impacts, with the exception of parental involvement. When several of these impeding agents combined, however, the rate of student progress was diminished, as shown by data on low gainers. (It should be noted that while profound hearing loss is noted as an impeding factor, students with profound hearing loss were both high gainers and low gainers. This suggests that severity of hearing loss only becomes an issue when other impeding factors are present.)

It seems that factors such as increased years of ASL usage, high IQ, genetic deafness, postlingual deafness, moderate hearing loss, high socioeconomic status, signed home language, presence of deaf family members, relatively high level of parental involvement, and strong parental signing skills acted as facilitating agents with slight, nonsignificant impacts, with the exception of parental involvement. When several of these factors combined, the rate of progress increased, as shown by the high-gaining students. Students whose backgrounds included multiple facilitating factors were competitive with and, in some cases, surpassed standards for progress by hearing monolingual students. Among the most substantial facilitating agents identified were increased years of ASL usage and higher levels of parental involvement, both of which were found to be statistically significant.

## Implications of the Study: Efficacy and Viability

The public school program described in the present study was quite atypical. Shareholders came together in a unique fashion to create a thriving program. Their consistent determination to collaborate, seek appropriate expertise, and improve pedagogy returned positive results. According to teachers in the program, implementation was quite challenging, however, and due caution is necessary in drawing conclusions based on finding related to this program. Because many districts employ only a small number of teachers of the deaf, they may simply lack the level of expertise needed, especially in regard to strategic language planning. Additionally, programs may lack the availability of sufficient language models (particularly, deaf teachers), appropriate curricula and assessment tools, opportunities for formalized training, an adequate critical mass of deaf and hard of hearing students, and qualified staff. Programs may fail to understand the importance of hiring fluent signers, and financial barriers may hinder their ability to recruit and retain certified interpreters. Accessibility and technological needs could be easily overlooked as well. Most important, administrators may not have the training needed to coordinate a collective effort involving all shareholders: deaf educators, special educators, regular educators, interpreters, parents, the postsecondary community, or the local Deaf community. The lack of any of one of these vital components could hinder successful implementation. Nevertheless, implementation is not impossible, especially with proper planning and support.

## Suggestions for Future Research

The need persists for research regarding implementation in public schools. A rigorous effort to find, evaluate, and improve existing programs is needed. Training opportunities need to be developed specifically for public school educators. Program evaluation tools that can be used effectively to identify strengths and weakness in program design are also needed. Quality screenings for teachers and interpreters are needed to measure levels of social and academic language in ASL and English to ensure that schools are using appropriate language models. Studies that consider specific instructional strategies are needed to ensure that practices are grounded in scientifically based research. Research-based curriculum products should also be developed to facilitate bilingual literacy for children who are deaf or hard of hearing. In addition, the possible negative implications for the dual language methodological option should be explored. If public schools are to fully consider this option, researchers must continue to investigate the relevant instructional methods and programmatic implications.

## Note

The present study was partially funded by the U.S. Department of Education, Grant No. H325E040078, Preparing Doctoral-Level Leaders in Deaf Education. The present article is also a result of the first author's master's thesis.—*The Authors*

## References

Andrews, J. F., Ferguson, C., Roberts, S., & Hodges, P. (1997). What's up, Billy Jo? Deaf children and bilingual-bicultural instruction in East-Central Texas. *American Annals of the Deaf, 142*(1), 16–25.

Baker, C. (2001). *Foundations of bilingual education and bilingualism.* Clevedon, England: Multilingual Matters.

Basil, K., & Quigley, S. (1977). The influence of certain language and communication environments in early childhood on the development of language in deaf individuals. *Journal of Speech and Hearing Research, 20,* 95–107.

Blumenthal-Kelly, A. (1991). Fingerspelling interaction: A set of deaf parents and their deaf daughter (pp. 62–73). In C. Lucas (Ed.), *Sociolinguistics in Deaf communities.* Washington, DC: Gallaudet University Press.

Bouvet, D. (1990). *The path to language: Bilingual education for deaf children*. Clevedon, England: Multilingual Matters.

Bowe, F. (1991). *Approaching equality.* Silver Spring, MD: TJ Publishers.

Butler, K., & Prinz, P. (1998). ASL proficiency and English literacy acquisition: New perspectives. Topics in Language Disorders, *18*(4), 30–46.

Cawthon, S. (2004). Schools for the deaf and the No Child Left Behind Act. *American Annals of the Deaf, 149*(4), 314–323.

Center for ASL/English Bilingual Education and Research (CAEBER). (2002). *Star schools handout of bilingual methodology.* Unpublished manuscript, New Mexico School for the Deaf, Santa Fe.

Charrow, V. (1981). The written English of deaf adolescents. In M. F. Whiteman (Ed.), *Writing: The nature, development, and teaching of written communication* (Vol. 1, pp. 179–187). Hillsdale, NJ: Erlbaum.

Cummins, J. (1976). The influence of bilingualism on cognitive growth: A synthesis of research findings and explanatory hypotheses. *Working Papers on Bilingualism*, *9*, 1–43.

Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of Educational Research*, *49*, 222–251.

Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In *Schooling and language minority students: A theoretical framework* (pp. 3–49). Los Angeles: Evaluation, Assessment, and Dissemination Center, California State University.

Cummins, J. (2003). *BICS and CALP.* Retrieved March 12, 2007, from http://www.iteachilearn.com/cummins/bicscalp.html

DeLana, M. (2004). *The impact of ASL/English bilingual education on public school students who are deaf/hard-of-hearing*. Unpublished master's thesis, Lamar University, Beaumont, TX.

DeLana, M., & Skarp. P. (2004). Unlocking syntax: Lessons in American Sign Language and English. Unpublished manuscript.

Fernandes, J. (1997). *Deaf education: A state of emergency* (a *Sharing Ideas* series paper). Washington, DC: Gallaudet University, Laurent Clerc National Deaf Education Center. Retrieved March 12, 2007, from http://clerccenter.galladet.edu/products/index.html

Freeman, Y., & Freeman, D. (1998). *ESL/EFL teaching: Principles for success.* Portsmouth, NH: Heinemann.

Gallaudet Research Institute (2005). *Annual survey of deaf and hard of hearing children and youth state summary report.* Washington, DC: Gallaudet University.

Hansen, B. (1994). Trends in the progress toward bilingual education for deaf children in Denmark. In C. Erting, R. Johnson, D. Smith, & B. Snider (Eds.), *The Deaf way: Perspectives from the international conference on Deaf culture* (pp. 605–614). Washington, DC: Gallaudet University Press.

Hoffmeister, R. (2000). A piece of the puzzle: ASL and reading comprehension in deaf children. In C. Chamberlain, J. P. Morford, & R. Mayberry (Eds.), *Language acquisition by eye* (pp. 143–163). Mahwah, NJ: Erlbaum.

Holcomb, T., & Peyton, J. (1992). *ESL literacy for a linguistic minority: The deaf experience.* Washington, DC: National Clearinghouse on Literacy. Retrieved March 12, 2007, from http://www.cal.org/ncle/digests/ESL_LITERACY.HTML (ERIC Document Reproduction Service No. ED353861)

Holt, J., Traxler, C., & Allen, T. (1997). *Interpreting the scores: A user's guide to the ninth edition Stanford Achievement Test for educators of deaf and hard of hearing students* (Gallaudet Research Institute Technical Report No. 97–1). Washington, DC: Gallaudet University.

Humphries, T., & MacDougall, F. (2000). Chaining and other links: Making connections between American Sign Language and English in two types of school settings. *Visual Anthropology Review, 15*(2), 84–94.

Jacobson, R. (1990). Allocating two languages as a key feature of a bilingual methodology. In R. Jacobson & C. Faltis (Eds.), *Language distribution issues in bilingual schooling* (pp. 3–7). Clevedon, England: Multilingual Matters.

Johnson, R., & Cohen, O. (1994). *Implications and complications for deaf students of the full inclusion movement* (Gallaudet Research Institute Occasional Paper No. 94–2). Washington, DC: Gallaudet University.

Johnson, R., Liddell, S., & Erting, C. (1989). *Unlocking the curriculum: Principles for achieving access in deaf education* Washington, DC: Gallaudet Research Institute.

Kannapell, B. (1974). Bilingual education: A new direction in the education of the deaf. *The Deaf American 26*(10), 9–15.

Knight, P., & Swanwick, R. (2002). *Working with deaf pupils: Sign bilingual policy into practice.* London: David Fulton.

Kuntze, M. (2004). *Literacy acquisition and deaf children: A study of the interaction between ASL and written English*. Unpublished doctoral dissertation, Stanford University, Stanford, CA.

Larson, M. (1999). *Meaning-based translation: A guide to cross-language equivalence* (2nd ed.). Lanham, MD: University Press of America.

LaSasso, C., & Lollis, J. (2003). Survey of residential and day schools for deaf students in the United States that identify themselves as bilingual-bicultural programs. *Journal of Deaf Studies and Deaf Education, 8*(1), 79–91.

Li, Y. (2005). *The effects of the bilingual strategy "preview, view, review" on the comprehension of science concepts by deaf ASL/English and hearing Mexican-American Spanish/English bilingual students.* Unpublished doctoral dissertation, Lamar University, Beaumont, TX.

Luetke-Stahlman, B. (1990). Types of instructional input as predictors of reading achievement for hearing impaired students. In C. Lucas (Ed.), *Sign language research* (pp. 325–336). Washington, DC: Gallaudet University Press.

Mayberry, R. (1989, April). *Deaf children's reading comprehension in relation to sign language structure and input.* Paper presented at the meeting of the Society for Research in Child Development, Kansas City, MO.

Mayberry, R. (1994). The importance of childhood to language acquisition: Evidence from American Sign Language. In J. C. Goodman & H. C. Nusbaum (Eds.), *The development of speech perception* (pp. 60–89). Cambridge, MA: MIT Press.

Mayberry, R., Chamberlain, C., Waters, G., & Doehring, D. (1999). *Reading development in relation to signed language input and structure.* Manuscript in preparation.

Mogford, K. (1988). Oral language acquisition in the prelinguistically deaf. In D. Bishop, & K. Mogford (Eds.), *Language development in exceptional circumstances* (pp. 110–131). London: Longman Group.

Moores, D., Kluwin, T., Johnson, R., Cox, P., Blennerhasset, L., Kelly, L., Ewoldt, C., Sweet, C., & Fields, L. (1987). *Factors predictive of literacy in deaf adolescents* (Final Report to the National Institute on Neurological and Communicative Disorders and Stroke, Project No. NIH-NINCDS-83–19). Washington, DC: National Institutes of Health.

Moores, D., & Sweet, C. (1990). Relationships of English grammar and communicative fluency to reading in deaf adolescents. *Exceptionality, 1*, 97–106.

No Child Left Behind Act of 2001, Pub. L. 107–110, 20 U.S.C. § 6301 *et seq*. (2002).

Nover, S. (2000). *The history of language planning in deaf education: The nineteenth century.* Unpublished doctoral dissertation, University of Arizona, Tucson.

Nover, S. (2005, April). *Language policy in deaf education.* Paper presented at the meeting

of the Center for ASL/English Bilingual Education and Research, Washington, DC.

Nover, S., Andrews, J., Baker, S., Everhart, V., & Bradford, M. (2002). *Staff development in ASL/English bilingual instruction for deaf students: Evaluation and impact study* (United Star Distance Learning Consortium Star Schools Project Report No. 5). Santa Fe: New Mexico School for the Deaf. Retrieved March 12, 2007, from http://www.nmsd.k12.nm.us/caeber/documents/year5.pdf

Nover, S., Christensen, K., & Cheng, L. (1998). Development of ASL and English competence for learners who are deaf. *Topics in Language Disorders, 18*(4), 61–72.

Nover, S., & Moll, L. (1997). Cultural mediation of deaf cognition. In M. P. Moeller & B. Schick (Eds.), *Deafness and diversity: Sociolinguistics issues* (pp. 39–50). Omaha, NE: Boys Town National Research Hospital.

Padden, C., & Hanson, V. (2000). Search for the missing link: The development of skilled reading in deaf children. In K. Emmorey & H. Lane (Eds.), *The signs of language revisited: An anthology in honor of Ursula Bellugi and Edward Klima* (pp. 435–448). Mahwah, NJ: Erlbaum.

Padden, C., & Humphries, T. (1988). *Deaf in America: Voices from a culture*. Cambridge, MA: Harvard University Press.

Padden, C., & Ramsey, C. (1998). Reading ability in signing deaf children. *Topics in Language Disorders*, *18*(4), 30–46.

Perfetti, C., & Sandak, R. (2000). Reading optimally builds on spoken language. *Journal of Deaf Studies and Deaf Education*, *5*(1), 32–50.

Prinz, P. (Ed.) (1998). ASL proficiency and English literacy acquisition: New perspectives. *Topics in Language Disorders, 18*(4), 30–46.

Prinz, P., & Strong, M. (1998). ASL proficiency and English literacy within a bilingual deaf education model of instruction. *Topics in Language Disorders, 18*(4), 47–60.

Quigley, S. P., Power, D. J., & Steincamp, M. W. (1977). The language structure of deaf children. *Volta Review*, *79*, 73–84.

Schildroth, A., & Hotto, S. (1996). Changes in student and program characteristics, 1984–85 and 1994–95. *American Annals of the Deaf, 141*(2), 68–71.

Schimmel, C. S., Edwards, S. G., & Prickett, H. T. (1999). Reading? . . . Pah! (I got it!): Innovative reading techniques for successful deaf readers. *American Annals of the Deaf, 144*(4), 298–308.

Singleton, J., Supalla, S., Litchfield, S., & Schley, S. (1998). From sign to word: Considering modality constraints in ASL/English bilingual education. *Topics in Language Disorders, 18*(4), 16–29.

Smith, A. (2006). *The performance of deaf students on a test of American Sign Language abilities—receptive (TASLA–R)*. Unpublished doctoral dissertation, Lamar University, Beaumont, TX.

Strong, M. (1995). A review of bilingual/bicultural programs for deaf children in North America. *American Annals of the Deaf, 140*(2), 84–94.

Strong, M., & Prinz, P. (1997). A study of the relationship between American Sign Language and English literacy. *Journal of Deaf Studies and Deaf Education, 2*(1), 37–46.

Supalla, S. (1994). Equality in educational opportunities: The Deaf version. In C. Erting, R. Johnson, D. Smith, & B. Snider (Eds.), *The Deaf way: Perspectives from the international conference on Deaf culture* (pp. 584–592). Washington, DC: Gallaudet University Press.