The written English vocabulary of 72 deaf elementary school students of various proficiency levels in American Sign Language (ASL) was compared with the performance of 60 hearing English-as-a-second-language (ESL) speakers and 61 hearing monolingual speakers of English, all of similar age. Students were asked to retell “The Tortoise and the Hare” story (previously viewed on video) in a writing activity. Writing samples were later scored for total number of words, use of words known to be highly frequent in children’s writing, redundancy in writing, and use of English function words. All deaf writers showed significantly lower use of function words as compared to their hearing peers. Low-ASL-proficient students demonstrated a highly formulaic writing style, drawing mostly on high-frequency words and repetitive use of a limited range of function words. The moderate- and high-ASL-proficient deaf students’ writing was not formulaic and incorporated novel, low-frequency vocabulary to communicate their thoughts. The moderate- and high-ASL students’ performance revealed a departure from findings one might expect based on previous studies with deaf writers and their vocabulary use. The writing of the deaf writers also differed from the writing of hearing ESL speakers. Implications for deaf education and literacy instruction are discussed, with special attention to the fact that ASL-proficient, deaf second-language learners of English may be approaching English vocabulary acquisition in ways that are different from hearing ESL learners.

Researchers have documented the strong relationship between vocabulary knowledge and literacy development. According to Nation (1990, p. 93), in everyday spoken English, 99% of what is said can be captured by the first 2000 most common words (see frequent-word lists such as Dale & Chall, 1948; Hillerich, 1978; Kucera & Frances, 1967; West, 1953). Furthermore, incidental learning of vocabulary (e.g., the learning of new vocabulary by listening to conversation, exposure to novel vocabulary through reading) accounts for a large proportion of first-language vocabulary growth by school-age children (Nagy, Herman, & Anderson, 1985). First-language learners add from three to seven new words per day to their vocabularies. Nagy and Herman (1987) suggest that even one incidental encounter with a novel word may be enough to learn it, while other researchers contend that 6 to 12 encounters may be a more realistic estimate (Jenkins & Dixon, 1983). Children learn new words from other sources.
such as television, computers, glossaries, and dictionaries (Nation, 1990). Teachers can also provide explicit vocabulary instruction in the classroom context.

As a result of their hearing loss, profoundly deaf children have great difficulty acquiring English vocabulary through the same incidental learning processes as hearing children. Because they do not overhear conversation and have limited early literacy experiences in English, deaf children struggle to develop their English vocabularies at age-appropriate levels. Many researchers have documented depressed English vocabulary and reading comprehension scores among deaf children when compared to their hearing peers (see King & Quigley, 1985; Marschark, 1997; Karchmer & Mitchell, 2003; Wilbur, 2000, for reviews). King and Quigley (1985) reported that deaf students usually have their lowest performance on vocabulary or word meaning subtests when compared to their performance on other standardized test domains such as spelling, mathematics, and language mechanics (e.g., punctuation, capitalization). LaSasso and Davey (1987) found that vocabulary scores correlated strongly with reading comprehension scores for the deaf students they studied. Paul and Gustafson (1991) also found similar correlations.

In 1972, Silverman-Dresner and Guilfoyle (researchers connected with Lexington School for the Deaf in New York) authored a monograph entitled “Vocabulary Norms for Deaf Children.” This list of 7300 words, based initially on Dale and Chall’s list of 3000 vocabulary words (Dale & Chall, 1948), was validated on a national sample of 26,414 deaf students between the ages of 8 and 17. Each deaf student was presented with two lists of 100 vocabulary terms randomly selected from the pool of 7300 words and was asked to select the correct definition (which appeared alongside three distractor definitions) for each word. Silverman-Dresner and Guilfoyle reported accuracy levels of respondents according to age and word type (using a criterion of 62.5% of children in the age group identifying the correct definition). Deaf students aged 8–9 correctly identified only 18 words, 6 of which were color terms, and none of which were function words (words serving a grammatical function such as prepositions). In fact, of the 65 function words from the pool, only half of them were correctly identified by more than 62.5% of the 16- to 17-year-old students. Silverman-Dresner and Guilfoyle provided no information about participant inclusion criteria or communication modes used by the deaf students and their teachers. We can only surmise from the date of research that the deaf students were either orally educated or beginning to use Total Communication; we have no way of knowing the students’ access to American Sign Language (ASL) outside of the classroom context. What we can take from this study is some evidence to support the notion that deaf children historically have struggled with English vocabulary, especially function words. However, since the method of Silverman-Dresner and Guilfoyle’s vocabulary assessment required reading four definitions per word, we also must question the language comprehension demands of the task and ask whether the same results would have been obtained if the deaf students were presented the definition choices in ASL.

In short, DeVilliers and Pomerantz (1992) are likely correct in their suggestion that “many hearing-impaired students are caught in a vicious circle: their impoverished vocabularies limit their reading comprehension and poor reading strategies and skills limit their ability to acquire adequate vocabulary knowledge from context” (p. 428).

Paul (1998) includes writing deficits as part of that vicious circle. He states that there is a reciprocal relationship between conversational and written forms of English, and deaf children are unable to benefit fully from this relationship. Based on their review of the past 50 years of research on deaf children’s writing, Marschark, Lang, and Albertini (2002) report that deaf students generally produce shorter and less structurally variable sentences than hearing peers, when they produce complete sentences at all. Although they are generally as competent as hearing peers in the use of punctuation and in spelling, deaf children tend to use “stock” words and phrases repeatedly in a text, and they use more articles and nouns and fewer adverbs and conjunctions. Words are frequently omitted, and sentences generally are less syntactically complete and less well interconnected in compositions than those of hearing peers. (p. 172)

Most studies have grouped together deaf children of varying sign language skill (but with similar hearing
loss levels) and have found that profoundly deaf children perform poorly on English vocabulary measures. The unique contribution of the current study is that we have categorized deaf children according to their proficiency level in ASL, which previous studies have not done. In the present study, we assess English vocabulary use by deaf children on an elicited writing task. The study includes children in the emergent stages of writing development (ages 6–12), whereas most prior writing and vocabulary research with deaf children has focused upon older writers (ages 10–18). Finally, we provide a context for the findings by offering parallel data from two comparison groups: hearing monolingual speakers of English and hearing English-as-a-second-language (ESL) speakers.

These two comparison groups (monolingual and ESL) are important for several reasons. First, our vocabulary measure is based upon word-frequency norms derived from hearing children’s writing samples (Hillerich, 1978). The writing elicitation task we designed needed to be validated in terms of the patterns of hearing children’s use of high-frequency words in English. However, a number of researchers have expressed concern over which norms (hearing vs. deaf reference samples) are appropriate for use with deaf populations (see Maller, 2003, for a review of assessment issues). Given these concerns and our interest in exploring the nature of deaf children’s vocabulary use (e.g., accessibility, selection, redundancy), we collected parallel data from hearing ESL speakers, a population that also may have difficulty with English vocabulary. As we interpret our findings with deaf writers with differing ASL proficiency levels, it will be useful to contextualize the results in terms of vocabulary use patterns established by native and nonnative speakers of English. For example, a pattern noted in high-ASL-proficient deaf children’s writing may be characterized as unique, unlike the patterns of hearing native and nonnative speakers of English, or alternatively, the patterns may be found to mirror vocabulary use of hearing ESL speakers, but not monolingual speakers.

Deaf Children’s Written English Skills

Length of text

Deaf children tend to write fewer words than their hearing peers on writing activities. For example, Yoshinaga-Itano, Snyder, and Mayberry (1996b) found that the 49 deaf students (ages 10–14) included in their study produced shorter essays than the hearing comparison group. However, these two groups did not differ in the number of propositions they expressed, indicating a similarity in conceptual expression; hearing students included more words within each proposition, yielding a greater overall total number of written words. Hearing students also introduced topics and then elaborated upon them while deaf students tended to introduce many new topic sentences without subordinated, elaborative information. Wilbur (2000) discussed similar findings and argued that deaf students have difficulty with pushing old information into the background and bringing new information into the foreground.

Syntactic structure

Deaf children’s writing typically contains simple sentences, showing limited use of compound and complex sentences involving conjoined phrases or subordinated clauses (Paul, 1998). Deaf writers are more likely to make errors by adding unnecessary words, omitting necessary words, and inappropriately substituting words. They have great difficulty with verb inflections, use of plurals, and passive voice. Wilbur (1977, 2000) suggested that deaf writers have more syntactic errors on the intersentential level, rather than intrasentential level, in that adjacent sentences within longer passages of text do not always connect to or have reference to each other.

Lexical/semantic structure

The content of deaf children’s written texts has been characterized as bland or stilted, having a limited vocabulary, relying heavily on same-item repetition, filled with content words (words that convey semantic information) and lacking in function words (words that convey grammatical information; Gormley & Sarachan-Deily, 1987; Maxwell & Falick, 1992; Quigley & Kretschmer, 1982; Quigley & Paul, 1984; Wilbur, 2000). Deaf children’s access to the distributional frequency patterns of English vocabulary (either spoken or in print) is undoubtedly disadvantaged. Marschark et al. (2002) proposed that frequency in print is
generally not a good indicator of vocabulary knowledge for deaf students. Function words, in particular, are highly frequent in English, but difficult to master for deaf children. Walter (1978) administered a cloze procedure test to 199 deaf students and 277 hearing students between the ages of 10 and 14 to assess English content-word (nouns, verbs, adjectives, and adverbs) vocabulary knowledge as a function of word-frequency level. Based on his findings, he asserted that a 10-year-old deaf child reading a book with controlled vocabulary drawn from the first 2000 most frequently used words in English could be expected to understand only about 30% of the words. This figure is considerably lower than that of the hearing 10-year-olds who demonstrated vocabulary knowledge at the 85% level of mastery.

In contrast, in studies examining deaf students’ higher-level semantic structure and cohesive use of language, better performance has been noted as compared to their syntactic or lexical knowledge (Gormley & Sarachan-Deily, 1987; Yoshinaga-Itano, Snyder, & Mayberry, 1996a). For example, Yoshinaga-Itano and Downey (1996) found that deaf children showed a significant increase in semantic structure (inference, sequencing, and story grammar) between the ages of 7 and 18. While Marschark, Mouradian, and Halas (1994) found that deaf children demonstrated reduced grammatical complexity and less figurative language than hearing peers, they did find that deaf children used a coherent “goal-action-outcome” sequence in their written stories, similar to hearing peers.

Deaf/ESL Comparisons

Only a few studies have compared the writing of deaf students to that produced by hearing ESL learners (see Paul, 1998, for a review), with most concluding that both groups show similar performance patterns in the omission of function words (e.g., prepositions, articles, conjunctions) and the order of difficulty of acquisition of syntactic structures. Langston and Maxwell (1988) asked a set of judges (all experienced in working with deaf students) to compare writing samples collected from deaf students (ages 15–19) and age-matched hearing ESL students in an anonymous sorting task. The judges could not sort the essays of these two groups in a reliable fashion.

While it was not a writing task, Mayberry, Lock, and Kazmi (2002) designed a grammatical judgment task involving the presentation of printed English sentences to deaf native ASL signers and hearing ESL learners. They found that both groups performed similarly. By contrast, a group of deaf adults who did not learn ASL until after age nine performed at chance level on the same grammatical judgment task. Charrow and Fletcher (1974) examined TOEFL and SAT test performance and found similarities between hearing ESL speakers and deaf children born to deaf parents in English structure and writing ability, but poorer performance among the deaf students in vocabulary and reading comprehension.

Examining the Relationship of ASL Proficiency to English Literacy Development

Wilbur (2000) contends that if a deaf child has a firm grasp of ASL when he or she enters the reading task, the situation becomes more similar to that of any learner of ESL. In contrast, Mayer and Wells (1996) argue that “in the case of the deaf student, ASL can develop the cognitive power that would support broad cognitive and conceptual transfers between ASL and English. However… the possibility of any linguistic transfer or interdependence is unlikely” (p. 105). As ASL has no written form, Mayer and Wells maintain that there is no logical opportunity to “transfer” literacy skills from their first language (ASL) to literacy skills of their second language (English). While the theoretical problems raised by Mayer and Wells are compelling, the problem remains that the research literature lacks empirical studies that investigate whether particular aspects of first-language ASL knowledge facilitate certain aspects of second-language English literacy.

Most previous studies examining deaf children’s development of English literacy have not made a clear distinction between ASL-proficient children and less-proficient signing deaf children, so a meta-analysis of the literature may not even be feasible. Some empirical studies have identified the number of deaf children born to deaf parents included in their sample, but
typically there are not enough of these children in the sample to warrant separate analyses. Even large-scale evaluations of American deaf children’s achievement performance (such as within the Stanford Achievement Test, 9th edition) have not identified deaf-of-deaf (and presumably ASL-proficient) as a distinct subgroup (Traxler, 2000). Israelite, Ewoldt, and Hoffmeister (1992) reviewed several studies that point to the superior performance of deaf children born to deaf parents on English literacy measures; however, these conclusions have been criticized because of small samples in the studies cited and the fact that many of the studies are outdated and in some cases unpublished. Based on these concerns, Marschark et al. (2002) and Paul (1998) argue that the purported “deaf of deaf” advantage is a premature conclusion that is still often cited in the research literature.

However, with the advent of new instruments developed to assess ASL proficiency (see Singleton & Supalla, 2003, for a review) researchers now have the opportunity to classify deaf students on the basis of individual ASL proficiency rather than parent hearing status. Indeed, a number of recent studies have found that higher ASL proficiency (regardless of parent hearing status) is positively correlated with higher performance on various measures (mostly reading comprehension) of English proficiency (Hoffmeister, 2000; Mayberry et al., 2002; Padden & Ramsey, 2000; Singleton, Supalla, Litchfield, & Schley, 1998; Strong & Prinz, 1997, 2000), especially among older deaf students.

Other researchers have come to similar conclusions and have advocated the advantages of interactive ASL instruction to teach English literacy in the classroom (Israelite et al., 1992; Lane, Hoffmeister, & Bahan, 1996; Marschark et al., 2002; Musselman, 2000; Paul, 1998; Supalla, Wix, & McKee, 2001; Wilbur, 2000). According to Paul (1998), world knowledge acquired through ASL can help deaf children expand their conceptual framework and build a more creative vocabulary. Maxwell and Falick (1992) also reiterate the role of world knowledge, communicative experiences, and genre expectations on the development of cohesiveness in writing.

Nevertheless, many researchers acknowledge that mapping ASL proficiency to English literacy is not a straightforward process (Mayer & Wells, 1996; Singleton et al., 1998; Supalla et al., 2001; Wilbur, 2000). According to Mayer and Wells (1996), the linguistic conditions facing deaf children do not match the conditions assumed by Cummin’s linguistic interdependence model (Cummins, 1991). Cummins has proposed that first-language literacy skills can transfer to second-language literacy.

While several researchers have asserted that ASL knowledge brings about greater world knowledge, broad conceptual transfers, and enhanced creative vocabulary, we are not aware of specific proposals characterizing the process of how ASL proficiency can facilitate English vocabulary development, especially given the lack of an ASL writing system. Nevertheless, based on what we have learned from previous studies, English function words would remain a challenge for the ASL-proficient learner of English because the syntactic elements conveyed by function words (prepositions, articles, conjunctions) in English are conveyed through different syntactic devices in ASL (grammatical facial expression, body posture, spatial modifications to signs; Mayer & Wells, 1996; Paul, 1998; Wilbur, 2000). However, English content words (e.g., nouns, verbs, and adjectives) may be more accessible than function words to an ASL-proficient signer because of the potentially higher number of sign-word equivalencies among content words.

In summary, deaf children, as a group, have been shown to perform significantly below their hearing peers across many measures of written English skill (see Albertini & Schley, 2003, for a review). In particular, their vocabularies are limited, as is their knowledge of English syntactic and semantic rules. What is not known is whether ASL proficiency may contribute to the successful development of certain English vocabulary forms. Furthermore, we need to understand better the comparative performance of hearing ESL learners and deaf English learners (of varying ASL skills) on the types of words they acquire and use and the breadth of their vocabularies. With this understanding, we can improve our theorizing and interpretation of potential “transfer effects” from proficient ASL to English and explore the possible application of ESL pedagogical theory to ASL-based deaf-education contexts.
Aims of the Present Study

In this study, we focused on several key aspects of low-, moderate-, and high-ASL-proficient deaf children’s written English vocabulary. We examined (a) text length (total number of words written); (b) use of words known to be highly frequent in children’s writing; (c) redundancy in their writing; and (d) use of function words in English. Further, we compared the written vocabulary performance of our deaf writers (who were at three ASL skill levels) to that of hearing monolingual speakers of English and hearing speakers of English as a second language. Based on the research reviewed thus far, we expected the following patterns to emerge in our deaf children’s writing samples when compared to hearing writers:

- Deaf children will write shorter stories than hearing children.
- Deaf children will produce a lower proportion of function words than hearing children.
- Deaf children may not produce words from a most frequent word (MFW) list at a proportion similar to hearing children (as a result of the overrepresentation of function words on the list and/or disadvantaged access to word-frequency patterns of English).
- Deaf children will show greater redundancy in their writing (e.g., higher repetition of words or use of “stock” phrases).

However, given that we classified our sample of deaf writers by ASL proficiency level (low-, moderate-, and high-ASL skill categories), we also expected to obtain a different pattern of results across our groups of deaf writers. Our hypothesis was that on some measures, such as novel-word use and repetitiveness, the high-ASL students would show a pattern of performance superior (i.e., greater “off-list” word use and less repetitiveness) to low-ASL students. This expectation was based on the assumption that high-ASL-proficient students have a broader vocabulary base in ASL and that this semantic knowledge assists them in their acquisition and use of less common words in English. No difference was expected between low- and high-ASL-proficient children in function-word use, as function words have much less direct overlap in ASL and English; i.e., both groups are expected to be equally disadvantaged in function-word development. One interesting issue was whether we would observe any differences among the ASL groups on particular English function words with common ASL sign equivalents (e.g., ON, MY). While high-ASL-proficient children would be expected to show better performance on these forms (as compared to those English function words without ASL sign equivalents), we were uncertain a priori whether low-ASL-skilled signers would have mastered enough ASL to know the equivalent signs—if they did, then we would expect similar beneficial transfer on those forms. Finally, with a solid language base, we expected that these high-ASL writers would take the writing stance of “trying to tell a story,” which would result in a writing product with diverse propositions and vocabulary use (no repetitive, formulaic sentences).

With respect to comparisons between deaf and hearing ESL learners, we expected to find differences between these groups in function-word use. Consistent with the prior research, deaf writers are expected to include fewer function words and in their writing, as auditory access to these forms offers ESL learners a distinct advantage over deaf learners in their acquisition and use. With the rationale that they have more restricted vocabularies in their second language and tend to use vocabulary words that they encounter with high frequency, we also expected ESL learners to produce a higher proportion of words from the MFW list. However, the issue with deaf writers and high-frequency word lists is more complicated. Outcomes in which they have a lower proportion of MFWs in their writing may be because (a) they are disadvantaged in their access to the distributional frequency patterns and have difficulty accessing highly frequent vocabulary, or (b) they have more creative vocabularies and are writing a relatively higher proportion of off-list words (thus reducing their on-list proportion). By examining the deaf writers within their ASL proficiency groups, and contextualizing their results within ESL and monolingual patterns, we may be able to enhance our understanding of these complicated issues.

Given that ESL learners also have a solid native language base and would be trying to tell a story with
diverse propositions, we expected no significant differences between high-ASL-signers, ESL learners, and monolinguals on their proportion of unique words (our measure of repetitiveness or redundancy). We expected low-ASL signers to have a lower proportion of unique words (i.e., greater repetitiveness), consistent with prior research on deaf writers.

Method

Participants

The participants in this study were divided into five groups for comparative analyses. Within each group there was adequate representation of participants across grade levels, spanning first through sixth grade\(^2\) (see Tables 1, 2 for a stem and leaf display of the distribution of hearing and deaf students included in the study). We obtained parental consent for all participants included in the study.

Deaf students with different levels of ASL proficiency. As part of an earlier research project conducted by Singleton and Supalla (1998), writing samples were collected from 74 deaf students with varying levels of ASL proficiency. In order to obtain a diverse sample of ASL skills, the deaf students were sampled from a residential school program and a self-contained classroom in public school using Total Communication (English-based signing co-produced with spoken English). Selection criteria for participant inclusion in the original research project included severe-to-profound hearing loss and no known disabilities that would interfere with learning. A Nonverbal IQ (Test of Nonverbal Intelligence; TONI-2; Brown, Sherbenou, & Johnsen, 1990) was administered to rule out global cognitive deficits. Scores for the deaf students tested ranged from 84 to 143 and were normally distributed with an average score of 110. School officials reported that no deaf students included in the sample came from homes with extreme poverty conditions (which could potentially interfere with learning aptitude). Forty-eight deaf students had hearing parents and 26 deaf students were born into families with deaf parents. Parent sign ability was not formally assessed. Two deaf students of hearing parents were dropped from the original sample of 74. One student wrote an essay about going home on the bus instead of retelling the story presented in the elicitation task (the tortoise and hare story), and the other student was an extreme outlier. As a third grader, he wrote an essay with over 230 words, almost double the average total words produced by hearing monolingual or ESL students, even at the highest grade level. While this deaf student was indeed an interesting individual case study of outstanding writing ability, clearly he was not representative of any student in this study, deaf or hearing. Therefore, 72 deaf students were included in the final analyses.

Each deaf student was administered the American Sign Language Proficiency Assessment (ASL-PA; Maller, Singleton, Supalla, & Wix, 1999) and assigned a proficiency score and rating of high-, moderate-, or low-ASL proficiency (high, \(n = 32\); moderate, \(n = 20\); low, \(n = 20\)). In previous analyses, Maller et al. determined that neither age nor grade correlated with ASL-proficiency score when used with a population between the ages of 6 and 12. In other words, a first grader could be rated as high-ASL proficient just as likely as a sixth grader could be rated as low-ASL proficient (as illustrated in Table 1). A high ASL-PA score was assigned to students who demonstrated a full range of ASL grammatical features in their spontaneous signing (see Maller et al. 1999, for details regarding

<table>
<thead>
<tr>
<th>ASL-PA proficiency level</th>
<th>Residential school environment</th>
<th>Self-contained classroom environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ASL ((n = 20))</td>
<td>1, 22222222</td>
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<tr>
<td></td>
<td>4, 55</td>
<td>66</td>
</tr>
<tr>
<td>Moderate ASL ((n = 20))</td>
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<td>3333, 5555</td>
</tr>
<tr>
<td></td>
<td>66666</td>
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<tr>
<td>High ASL ((n = 32))</td>
<td>111</td>
<td>22222</td>
</tr>
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<td>33333</td>
<td>44444</td>
</tr>
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<td></td>
<td>55555</td>
<td>666666</td>
</tr>
</tbody>
</table>

Table 1: Stem and leaf display of deaf students’ grade level by ASL-proficiency level and school environment.
ASL assessment procedures and psychometric properties of the ASL-PA instrument).

**Hearing ESL speakers.** Hearing English-as-a-second-language students \((n = 60)\) were selected from a Midwestern U.S. elementary school with a special “magnet” bilingual program that supports native language education and literacy experience. The ESL students, who represent 14 different language backgrounds, were selected according to the following criteria: they (a) were learning ESL; (b) had lived and attended school in the United States for at least one year, but not more than two and one-half years; (c) had emergent-to-proficient literacy skills in their native language (according to their teacher); (d) were expected by their teachers to be able to complete the writing task in both their native language and in English; and (e) had no known language or learning disability. We originally sampled 61 ESL students, yet one student was dropped from the analysis because he did not write any words in the writing booklet used for this task. We included all 1st–5th grade ESL students who met the selection criteria. We did not obtain family SES information for this group, and we are assuming some diversity in the population as the students came from many different family income and education backgrounds (the districtwide magnet program busses ESL students to the campus rather than draw from the surrounding school neighborhood, and parents include Ph.D. students at a nearby university as well as agricultural workers).

**Hearing monolingual speakers of English.** A group of 66 hearing students were randomly selected from two public elementary schools in the Midwestern U.S. Half of the students came from a school population that was predominantly middle to upper socio-economic class, and the other half attended a school that was predominantly lower socio-economic class. Our purpose in selecting students from these two schools was to ensure a range of student backgrounds and diversity in literacy experiences. As the control or baseline group, the selection had to capture the natural range of performance levels with respect to written literacy. Struggling writers can be found at all grade levels among the hearing monolingual population. All students were identified by school staff members as being native, monolingual speakers of English and having no known disabilities that would detract from their performance on the writing task. No students were dropped from the original sample of 66 monolingual students.

**Participant sample decisions.** The sample of deaf students was one of opportunity; these writing samples were obtained from another research project data set (Singleton & Supalla, 1998). We knew the sample included signers of low-, moderate-, and high-ASL proficiency. The hearing ESL and monolingual samples were collected to “mirror” the distribution in the deaf sample in order to establish baseline vocabulary information, necessary for interpreting the potential differences among the deaf children of differing ASL proficiencies. Another design approach would have been to conduct a cognitive assessment on all participants and match the deaf and hearing participants on cognitive performance rather than grade or age as deaf children are notoriously behind their grade level hearing peers in their academic performance. However, this alternate approach was not feasible for the present study for at least four reasons. First, according to Maller (2003), there is considerable debate about the appropriateness of particular assessment instruments when used with both deaf and hearing children for “leveling” purposes (i.e., a test used with hearing children may underestimate a deaf child’s cognitive skills). Second, Maller also questions whether cognitive scores will reliably predict deaf children’s performance on spoken-language measures. Third, other issues regarding language accessibility and testing would arise for the cognitive assessment of the hearing ESL speakers. Finally, the public schools

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Stem and leaf display of hearing students’ grade level distribution</th>
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<tbody>
<tr>
<td>Hearing ESL ((n = 60))</td>
<td>11111111111111111</td>
</tr>
<tr>
<td></td>
<td>33333333</td>
</tr>
<tr>
<td></td>
<td>55555555555</td>
</tr>
<tr>
<td>Hearing monolingual ((n = 61))</td>
<td>11111111111111111</td>
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<tr>
<td></td>
<td>3333333333333</td>
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<td></td>
<td>5555555555555</td>
</tr>
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</table>
available to us were not amenable to us conducting cognitive assessments of the hearing children. The school personnel and parents of the participants agreed only to us collecting a writing sample from the hearing participants.

Procedure

Each student was shown a three-minute silent cartoon of the classic tale “The Tortoise and the Hare.” In this video, the characters do not have any verbal exchange, but there is a considerable amount of posturing and nonverbal signals exchanged between the tortoise and the hare. The video begins with the start of the race, then the hare zooms ahead of the tortoise and, confident that he is far ahead of the tortoise, the hare stops to take a nap under a tree. Meanwhile, the tortoise slowly catches up and passes the sleeping hare. The hare wakes up and tries desperately to catch up and win the race, but the tortoise stretches out his neck at the finish line and wins the race. The hare reacts to his loss with shock and the crowd cheers for the tortoise.

The video served as the stimulus for the writing activity for all participants. All students watched the video in groups of five to eight students and were asked to write the tortoise and the hare story without helping each other. The deaf students were asked by a deaf native ASL signer to retell “The Tortoise and the Hare” story in sign. Approximately one week later, the deaf students viewed the videotape again in groups of 5 to 8 and were asked by a hearing native ASL signer to retell the story in written English.

In order to match the procedure that was used with the deaf students, the ESL students were also asked to write the story twice: first they wrote it in their native language and then one week later, after viewing the videotape again, they wrote the story in English, their second language. The ESL speakers’ native language writing samples have not been translated or coded for this project. The hearing monolinguals were only administered the writing task once, following the same video elicitation procedure described above.

Writing booklet. First- through third-grade students received four blank pages for writing their stories. Each page included one still image taken from the video as a picture prompt on the top half of the writing page. Fourth- through sixth-grade students received six-page picture-prompt packets. Most students did not simply describe the picture on the page; rather, the samples indicated that they retold the story without being anchored to the picture prompt. This interpretation is based on the students’ inclusion of written information on the page that was not included in the picture and also on the fact that children’s stories flowed through multiple pages, with events extending past the picture that correlated with their text.

Occasionally, students would ask for help with spelling a word. Because the purpose of this task was not centered on spelling accuracy, the experimenter was allowed to spell or fingerspell a word upon a student’s request (but no more than twice at a normal pace). We did not want children to have their writing flow disrupted by a spelling challenge. If the child continued to struggle, we encouraged them either to skip the word and keep going, draw a picture, or make a good guess and move on. We wanted each child to feel positive about the writing task. Children were told that they could withdraw at any time and that this writing sample would not be counted as part of their schoolwork or evaluated as such. There was no strict timeframe for the task administration, but after 45 minutes the children were told to wrap it up as best they could. Most children finished within 20 to 30 minutes. No child withdrew from the study and most seemed to enjoy the writing activity. All children were given a colorful pencil for their participation in the project. Participating schools were given Visual Dictionaries in appreciation for their cooperation in the project.

Coding Procedures

A straightforward total word measure was used for the present study. This is a simple count of every word written, including misspelled but interpretable words (such as trtle for turtle). Note that uninterpretable words were not counted in the total-word measure. Total word count serves as the denominator for the proportional data reported in the vocabulary analyses.

The focus of the current study was an investigation into vocabulary use in the writing samples we collected from deaf and hearing students. The vocabulary analysis included the following measures: total words, frequent words, unique words, and function words.
The first stage of coding the written samples was conducted by a team of five coders, all of whom were extensively trained. In a second coding process, 25% of the samples coded by this team were randomly selected to check for errors. Total-word, frequent-word, and unique-word scoring revealed very few coding errors. Function-word scoring indicated a higher rate of coding errors. Two of the authors subsequently reviewed all samples to correct all function-word scoring. After this step, only a very small number of disagreements emerged and were corrected before final analyses were conducted.

Frequent words. We began with a 99-word list of “most frequently used words in children’s writing” (Hillerich, 1978, as cited in Luckner & Isaacson, 1990). We added 6 highly common words that were specific to this tortoise and hare task (race, rabbit, shhhh, sleep, turtle, win). All writing samples were examined and words that appeared on the MFW list were tallied (see Appendix A for the list of the 105 words). For each participant, we determined the proportion (out of total words written) of frequent words and nonfrequent words (i.e., words that were off the MFW list).

Unique words. In order to quantify the redundancy or repetitiveness of vocabulary use, we counted the number of unique words used (i.e., five repetitions of the same word still count as one in this analysis). Distinct conjugations of verb forms were counted as unique words. Plural forms of nouns were not counted as distinct forms, rather they were counted as a multiple of the singular form. The proportion is reported as the number of unique words divided by the total number of words in the sample. This proportion is also known as a type token ratio. This analysis enabled us to identify children who wrote a large number of words but had a small creative vocabulary (i.e., those who used the same words repetitively). We found that all participants used the same character-identifying labels “hare” and “tortoise” (or more commonly, rabbit and turtle), repeatedly. Thus, what we were looking for was redundancy beyond the expected use of story character names.

Function words. We recognized that MFW lists typically contain a high number of function words. The function-word category includes elements that convey grammatical information such as pronouns, conjunctions, articles, auxiliaries, demonstratives, quantifiers, and prepositions (Tartter, 1986). We also included adverbs in this category and the words no, not, and yes. Previous research has suggested that deaf children have great difficulty with function words in their English writing (Albertini & Schley, 2003). Because of the overrepresentation of function words on Hillerich’s MFW list (approximately 65%), we also conducted an analysis of the data that considers function-word category membership as opposed to frequency list status.

Results

In the analysis of variance, language group was a fixed factor (low ASL, moderate ASL, high ASL, ESL, monolingual). The four dependent variables were number of total words (TW), proportion of most frequent words (MFW), proportion of unique words (UW), and proportion of function words (FW). Grade level was entered as the covariate for this analysis. This statistical procedure controls for the grade level of the child and permits us to investigate differences that may be due to language group background rather than age. For each vocabulary measure, the overall ANOVA was significant (TW, $F = 12.123, p < .0001$; MFW, $F = 5.532, p < .0001$; UW, $F = 4.704, p < .01$; FW, $F = 47.884, p < .0001$). A summary of estimated marginal means for each vocabulary measure is presented in Table 3. Estimated marginal means reflect an adjustment for the covariate (grade level). We first discuss the results for each vocabulary measure, and subsequently provide a summary of the performance of each language group on this writing task. For all interpretations of statistical significance, we used an alpha-level of .05.

Total Words

Pairwise comparisons of the estimated marginal means (Bonferroni test) indicated that the hearing monolingual group ($M = 83.98$) did not write significantly more words than the ESL ($M = 83.33$) group ($p = .914$). The low-ASL group ($M = 55.11$) did not write significantly more words than the moderate-ASL ($M = 45.92$) and high-ASL ($M = 44.93$) groups. However,
the three deaf groups wrote significantly fewer words than the two hearing groups on the total word measure, a result consistent with previous research.

**Most Frequent Words**

In the monolingual group, 66% of their words were on the MFW list, which sets the baseline for use of highly frequent or common vocabulary. Therefore, 34% of a native English speaker’s vocabulary would be interpreted as “off the MFW list” or an estimate of their creative vocabulary use (see Luckner & Isaacson, 1990, for a similar interpretation). Thus, an MFW proportion greater than 66% indicates a reliance on highly common words and the use of less creative vocabulary. Interestingly, the low-ASL group (77%) had the highest proportion of words that appeared on the MFW list, significantly higher than all other groups (all p values < .02). By contrast, the high-ASL (65%) and moderate-ASL (67.5%) groups did not differ significantly from the monolingual group on this measure. The ESL group (70%), as we had predicted, had a significantly higher proportion of MFW than the monolingual group (p < .02).

It is interesting to note that the high-ASL group produced more vocabulary that would be considered less common, diverging away from the MFW list, than the ESL group and the low-ASL group. Recall our two earlier predictions, especially with respect to deaf writers. A lower MFW proportion could mean difficulty mastering common core vocabulary or it could mean (similar to the interpretation we afford monolinguals) that the writers have generated a higher proportion of creative off-list vocabulary. The comparative pattern of the low ASL to high ASL reveals that these two groups of deaf writers have very different patterns with respect to their use of less common English words. The striking fact that low ASL writers had the highest proportion of MFW-list vocabulary (and the lowest proportion of off-list creative vocabulary) of all groups supports the interpretation that high-ASL proficiency affords a different entry point into less-common English vocabulary acquisition.

**Unique Words**

This measure involved counting a distinct word only once (regardless of repetitions of the same word in the passage), or a type token ratio. A high proportion on this measure was interpreted as an indicator of vocabulary breadth. A low proportion would indicate high redundancy or formulaic writing. Of the monolingual group’s vocabulary, 57% was unique (i.e., not repeated again in the passage)—we considered this the target level of performance. The high-ASL (57%) and moderate-ASL (57%) groups obtained the same unique word proportion and did not differ significantly from the monolingual group. The high- and moderate-ASL and monolingual groups performed significantly higher than the low-ASL group, which had the lowest proportion of unique words (46%). In sum, the low-ASL group had the greatest redundancy (using many of the same words repeatedly) in their written text. The ESL group (52%) was very close to outperforming

### Table 3 Summary of vocabulary measure performance by language group

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of total words</th>
<th>Proportion of words on MFW list</th>
<th>Proportion of unique words</th>
<th>Proportion of function words</th>
<th>Proportion of unique function words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monolingual</td>
<td>83.98</td>
<td>.66</td>
<td>.57</td>
<td>.585</td>
<td>.28</td>
</tr>
<tr>
<td>(n = 66)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESL</td>
<td>83.33</td>
<td>.70</td>
<td>.52</td>
<td>.56</td>
<td>.255</td>
</tr>
<tr>
<td>(n = 60)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low ASL</td>
<td>55.11</td>
<td>.77</td>
<td>.46</td>
<td>.43</td>
<td>.17</td>
</tr>
<tr>
<td>(n = 20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate ASL</td>
<td>45.92</td>
<td>.675</td>
<td>.57</td>
<td>.28</td>
<td>.17</td>
</tr>
<tr>
<td>(n = 20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High ASL</td>
<td>44.93</td>
<td>.65</td>
<td>.57</td>
<td>.29</td>
<td>.16</td>
</tr>
<tr>
<td>(n = 32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: All proportions are calculated with total word as the denominator. The estimated marginal means have been adjusted to take the covariate (grade level) into account.*
the low-ASL group (46%), but did not reach the .05 alpha level of significance (\(p = .06\)) used for these analyses.

**Function Words**

Regardless of frequency list status, over half of the monolingual (58.5%) and ESL (56%) students’ total vocabularies for this task could be characterized as function words, conveying grammatical information in English. The monolingual and ESL groups did not differ significantly from each other on the function-word proportion measure (\(p = .189\)) and produced significantly higher proportions than all three ASL groups. The moderate-ASL (28%) and high-ASL (29%) groups were not significantly different from each other in their proportion of function words used in their writing samples. While the low-ASL (43%) group used a significantly higher proportion of function words in their writing than moderate- and high-ASL groups (\(p \leq .001\)), their proportion was still significantly lower than the ESL and monolingual groups.

A more detailed examination of the relative use of common function words (i.e., those on the MFW List) and novel function words (i.e., those off the MFW List) by each group did not yield any support for group differences. In general, between 76 and 87% of the function words used by all students, regardless of language group, came from the MFW List. One interesting finding was that high-ASL-proficient (as compared to low-ASL-proficient) signers had a significantly greater likelihood of using function words on the MFW list that had a common ASL sign equivalent (e.g., ON, AFTER)3.

All three ASL groups were not significantly different from each other in their limited variation of function words. The proportion of unique function words for each group was as follows: low ASL (17%), moderate ASL (17%), and high ASL (16%). The three ASL groups had significantly fewer unique function words compared to the monolingual (28%) and ESL (26%) speakers (all pairwise comparisons had \(p\) values less than .0001, and the two hearing groups were not significantly different from each other, \(p = .055\)).

In summary, these results enhance our understanding of the higher proportion of function-word use observed in the writing samples of low-ASL-proficient signers. They may use more function words overall in their writing than high-ASL signers, but they are using the same few function words repeatedly. They do not demonstrate the same level of variability in function-word use that we observe in the writing samples of monolinguals and ESL speakers.

**Summary: Language Group Vocabulary Profiles**

**Hearing monolinguals.** Monolingual speakers of English had little difficulty performing this writing task. While there was a range of performance across grades, we controlled for grade level in all analyses. These data serve as a baseline for target writing performance on the “Tortoise and Hare” story-retelling task. The hearing monolingual students had an average of 83.98 total words. Out of this total, 66% were words found on the MFW list, 57% of the words were unique, and 58% of the words were considered function words. Appendix B provides a representative writing sample of a 3rd-grade hearing monolingual student.

**ESL speakers.** The ESL students (\(M = 83.33\)) performed similarly to the monolingual group (\(M = 83.98\)) in the total word measure and proportional use of function words (56%). However, the ESL students tended to use a higher proportion (70%) of frequent words (common words appearing on the MFW list) and demonstrated fewer (52%) unique words (i.e., were more redundant in their writing) than their monolingual counterparts. In sum, the ESL students could be characterized as sticking with highly frequent words and having a tendency to be more repetitive than monolinguals. However, as a group, the ESL students do appear to have adequate access to function words in English. Appendix B includes a representative writing sample from a 3rd grade hearing ESL student.

**Low-ASL group.** The low-ASL group (\(M = 55.11\)) wrote significantly fewer words than their hearing counterparts, but did not differ significantly from the moderate- and high-ASL groups on the total word measure. The low-ASL group used a significantly higher proportion of function words (43%) in their writing than the moderate-ASL (28%) and high-ASL (29%) groups, which was most likely due to high repetitiveness of a limited number of forms. Of all
groups, the low-ASL group demonstrated the highest proportion of words that could be found on the MFW list (77%). The low-ASL group also had the lowest level of uniqueness in their writing (46%), significantly worse than all other groups except the ESL group, from which it did not significantly differ. While both low-ASL and ESL groups had a higher proportion of common words than the monolingual group, the key difference is that the low-ASL group had a much higher proportion of common words and was significantly more repetitive with a limited range of function words. Based on this finding, we can argue that perhaps the ESL writers were more comfortable with using common vocabulary, but at least they included a broad range of these common forms in their writing. On the other hand, the low-ASL writers appeared more formulaic, using a limited number of common forms with high repetition in their text. Appendix B includes a representative writing sample by a 3rd-grade low-ASL-proficient deaf student. The formulaic writing style is well illustrated in this example. This student includes function words (such as I, am, can, will), but they are used repeatedly as stock phrases in a formulaic fashion.

**Moderate- and high-ASL groups.** The moderate- and high-ASL groups were not significantly different from each other on any vocabulary measures in this study, thus the reported results below generally characterize both groups. On total words, the moderate- and high-ASL groups performed at the same level as the low-ASL group, and all three deaf groups performed significantly below the monolingual and ESL groups. In terms of words on the MFW list, the moderate- and high-ASL groups were not significantly different from the hearing monolingual speakers and, interestingly, exhibited a different pattern from hearing ESL and the low-ASL groups. The moderate- and high-ASL groups demonstrated a higher proportion of unique words in their writing at a level that surpassed the low-ASL and hearing ESL groups. Moreover, they were not significantly different from monolingual speakers on this unique-words measure. The moderate- and high-ASL groups had the lowest proportion of function words in their writing, (significantly below low-ASL, ESL, and monolingual groups).

In summary, the moderate- and high-ASL groups used diverse and original vocabulary to communicate their thoughts. While their vocabulary does not necessarily reflect the distributional frequency patterns most common to hearing children (i.e., their writing tends not to include the high proportion of function words typical of hearing children’s writing), they produce words that are novel and creative. This writing style is well illustrated in Appendix B by the representative sample of a 3rd-grade high-ASL-proficient deaf student. The reader of this passage gets a clear sense that this student has retold the story in proper chronological sequence and incorporates creative vocabulary that characterizes the inner thoughts of the main characters. While there are noticeably few function words used in this story, this student attempts to use semantically rich vocabulary such as tiptoe, ignore, puzzle, and worry.

**Discussion**

This study compared three groups of deaf students (low-, moderate-, and high-ASL proficient) and two groups of hearing students (monolingual English speakers and ESL speakers) on four vocabulary measures as assessed through analysis of their writing samples. The low-ASL group exhibited more of the patterns that would have been expected based on previous research on deaf children’s writing and vocabulary use. Their writing was redundant, that is, they used stock vocabulary in a repetitive fashion. While we documented higher proportion of function-word use, we found that the low-ASL-proficient students were simply using a low number of function words with high repetitiveness. We should also note that in this analysis, we were simply counting the presence of a function-word attempt. We have not formally evaluated the accuracy of its usage.

It is important to consider the fact that a majority of the low-ASL students in this sample attend public school in a self-contained classroom for deaf students. The predominant communication mode in the classroom was Total Communication (English-based signing simultaneously presented with spoken English). Thus, their daily classroom experience may have placed a greater focus on certain function words and this may explain the higher frequency and redundancy of such forms in their written stories. Alternatively,
a fragile linguistic system and tendency to be formulaic may also account for this pattern we observed. Wilbur (2000) suggested that teaching techniques used with deaf children artificially hold students to a stilted and choppy style of writing that is based on teaching them grammatical structures in isolation without giving them a clear understanding of communicative function in context.

Nevertheless, function words are used by the low-ASL group at a frequency rate that is still far lower than the ESL students in this sample. This result, we maintain, highlights the inaccessibility of the distributional patterns of function words in a deaf child's everyday experience with English even when his or her school context places a strong emphasis on speaking and signing English.

The high-ASL group's performance on this writing task revealed a departure from the classic findings of previous research with deaf children. We found that while these deaf writers still struggled with function words and generally wrote fewer words overall than their hearing counterparts, they demonstrated evidence that their expressive vocabularies in English are creative (nonformulaic) and diverse. The high-ASL group did not rely as much on MFWs; rather, they generated nonfrequent (off the MFW list) words at rates similar to that of monolingual speakers. Moreover, they outperformed ESL speakers on the proportion of nonfrequent words in their writing. A preliminary analysis of patterns of using English vocabulary which have ASL sign equivalents suggested some possible learning advantage. Further analyses may reveal particular ASL vocabulary that transfers well in terms of English vocabulary development.

These findings suggest that in this writing task, deaf children who are highly proficient in ASL use English vocabulary in ways that are different from their low-ASL-proficient and hearing ESL peers. It appeared that when writing in English, the high-ASL students drew upon their semantic understandings in ASL and generated propositions that included novel and meaningful (although mostly content word) vocabulary. While function-word use and grammatical accuracy are still pervasive problems, it is clear that these students are communicating their ideas through text and not trying to generate formulaic sentences as if filling in a workbook.

Research Implications for Deaf Education

How do these vocabulary findings translate into recommendations for educational practice? The primary point that parents, educators, and language specialists can take from this study is that deaf children with moderate- to high-ASL skills are using English vocabulary in ways that appear different from the patterns observed with profoundly deaf children with low-ASL skills. In this study, high-ASL-proficient children appeared to tap into their broad semantic knowledge and generated novel vocabulary in their English writing, whereas low-ASL-proficient children produced writing that reflected formulaic reproduction of a limited range of forms. For all deaf children, access to the distributional frequencies of English vocabulary is most likely reduced, but proficiency in ASL may provide a new entry point into the learning and use of English vocabulary. This is an important point that is perhaps overlooked in educational practice.

One pedagogical approach might be to develop an MFW list for second-language learning of English that would be appropriate for deaf students fluent in ASL. With such a list, educators could use ASL to facilitate the development of easy-to-learn vocabulary for deaf students. Also, based on the idea that there may be some advantage to learning English function words that have an ASL sign equivalent, educators could explore new ASL-based approaches to teaching English function words.

What needs further study is how ASL knowledge could potentially shape a deaf child's English vocabulary learning process. Continued study of this ASL advantage for vocabulary breadth and diversity is important for developing techniques and strategies for connecting sign to print.

This study also reinforces previous research which suggests that deaf children exhibit difficulties with function words in English, and they also lack some of the elaboration skills that we observe in hearing writers (compare the level of elaboration in the high-ASL to the hearing monolingual passage in Appendix A). Educators may want to explore instructional strategies for English function words that acknowledge the deaf child's experiential deprivation and barrier to incidental learning of these forms. Wilbur (2000) argues
that in deaf education, instruction of English structure often focuses on isolated sentences and thus limits a deaf child’s input to connected discourse. ASL-proficient children are quite capable of generating elaborative stories and cohesive ties in ASL, thus future studies could explore ASL-based ways to connect these known concepts into their English writing to enhance both text length and elaboration.

Finally, this study suggests that educators should use some caution when considering ESL teaching strategies with deaf children. Neither the low- nor high-ASL groups exhibited vocabulary use patterns mirroring the ESL students, a result that is somewhat inconsistent with Paul (1998) and Langston and Maxwell’s (1988) suggestion that the writing of deaf students is similar to that of ESL speakers. It is clear that hearing gives one an undeniable advantage in terms of exposure to the probabilistic patterns of vocabulary in English. The ESL students generated a higher proportion of common words (from the MFW list) and greater redundancy (fewer unique words) in their writing as compared to monolingual speakers. However, their text length and proportion of function words used was similar to monolinguals. Clearly, these ESL children exhibited some weaknesses in their writing, yet their high-proportioned use of function words or attempts clearly demonstrate an important contrast with deaf writers. Again, this is critical when we compare teaching strategies traditionally used with deaf students to ESL teaching strategies, which may be based upon different assumptions about access to function words. Our intention is not to devalue some of the potential strengths of ESL pedagogy in deaf education; we only seek to illustrate that deaf learners (especially those with high- vs. low-ASL skill) are different than hearing ESL learners and that appropriate adaptations should be investigated before teachers of the deaf adopt an ESL approach.

In closing, we wish to emphasize the importance of writing stories that have something to say. Deaf students who generate repetitive and formulaic sentences are not demonstrating that they are true writers. While the ASL-proficient students lacked important grammatical elements in their stories, their writing demonstrated original and creative expression. These children are indeed thinking and creating. Therefore, as educators, the onus is upon us to harness those novel thoughts that might be expressed so fluently in ASL and develop instructional techniques that can connect this creativity to their developing literacy skills in English.

Appendix A: List of 105 Most Frequent Words Used for Coding Writing Samples

Content Words

VERBS: come, came, get, got, go, going, went, make, play, put, said, saw, see, sleep, win, write

NOUNS: day, friend, home, house, mother, rabbit, race, school, time, turtle, one, two

ADJECTIVES: good, little, dear

OTHER: shhh

Function Words

ARTICLES: a, an, the

PREPOSITIONS: about, after, as, at, back, by, down, for, from, in, of, on, out, over, up, to, with, like

PRONOMINALS/DEMONSTRATIVES: he, she, me, you, us, we, they, I, it, his, her, him, my, your, their, our, them, this, that

CONJUNCTIONS/CONNECTIVES: and, because, but, if, or, then, so, well

ADVERBIALS: here, how, just, now, there, very, what, when

AUXILIARIES: can, could, will, would

COPULA: (TO BE): am, are, is, was, were

VERB AUXILIARIES: had, has, have, do, did

QUANTIFIERS: all, some

NEGATION: not

Notes:

All forms of the verb have and do were counted as function words because they are not simple verbs; in other words, they also can function as a verbal auxiliary form (‘‘She has learned how to play soccer’’; ‘‘He did not know how to play soccer’’).

Six words (in italics) were added to Hillerich’s original list of 99 words. These words were related to the story and were highly frequent in the writing samples.
Appendix B: Representative Writing Samples from 3rd-grade Students in Each Group

<table>
<thead>
<tr>
<th>Deaf, Low ASL</th>
<th>Deaf, High ASL</th>
</tr>
</thead>
<tbody>
<tr>
<td>I rabbit</td>
<td>Turtle and Rabbit Race Try</td>
</tr>
<tr>
<td>I turle</td>
<td>Who win turtle</td>
</tr>
<tr>
<td>I can fast rabbit</td>
<td>Rabbit sleep tiptoe Turtle and Wake Rabbit</td>
</tr>
<tr>
<td>I can fast win turle</td>
<td>Miss Race Laugh</td>
</tr>
<tr>
<td>I can win chase</td>
<td>Turtle walk slow</td>
</tr>
<tr>
<td>I can win chase rabbit</td>
<td>Rabbit Sleep</td>
</tr>
<tr>
<td>I can win chase turle</td>
<td>Turtle Puzzle</td>
</tr>
<tr>
<td>I am can win bed</td>
<td>Worry</td>
</tr>
<tr>
<td>I am can win rabbit bed</td>
<td>Igre</td>
</tr>
<tr>
<td>I am can win turle bed</td>
<td>eft turtle</td>
</tr>
<tr>
<td>I am can win under rabbit bed yes</td>
<td>Not Fair Win</td>
</tr>
<tr>
<td>I am can win rabbit and turle bed yes</td>
<td>Told Wirn</td>
</tr>
<tr>
<td>I am can win fight</td>
<td>Smat Learn</td>
</tr>
<tr>
<td>I am can will win rabbit turle</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hearing ESL</th>
<th>Hearing Monolingual</th>
</tr>
</thead>
<tbody>
<tr>
<td>One day rabbit and turtle was race. The rabbit can run fast then turtle. The rabbit think that turtle is far away from rabbit. So rabbit sleepy. Soon turtle was came to place that rabbit sleep. Turtle was going very quite. Soon turtle came to finish line. Rabbit was late than turtle. Rabbit fall down. When the rabbit was trying to stand the tutle was on the people’s hand. The turtle was happy. Rabbit was surprise and angry. Note. Misspellings are as they appeared in original writing sample.</td>
<td></td>
</tr>
<tr>
<td>The rabbit and the turtle were at the starting line. After that they were running. Rabbit was far away from the turtle. So the rabbit went to sleep next to a tree. While the rabbit was sleeping the turtle walked past the rabbit. After that the rabbit woke up and the turtle was near the finishing line. The turtle stretched his neck out and touched the finishing line. The rabbit was surprised that had won The end</td>
<td></td>
</tr>
</tbody>
</table>

Notes

1. One exception is that proposed by Supalla, Wix, & McKee (2001) who have implemented an instructional intervention that involves deaf students’ learning and use of an intermediary coding system for ASL writing, subsequently making a conceptual link to an English “gloss” writing system, and then developing the English print form of the word. In a sense, it is a bridging strategy to permit the child to “write signs”, then use this form to look up the English form in an ASL/English dictionary that they helped to create. Eventually, the sign-writing is no longer needed once the children develop a large print-English vocabulary. The effectiveness of this intervention is still being investigated.

2. The deaf students attended grades first through sixth, but the hearing student sample only went up to fifth grade students. This discrepancy was due to the fact that we were unable to collect writing samples from hearing middle school students (6th grade).

3. A native signer of ASL reviewed the MFW list and determined whether there was a common ASL equivalent sign for each of the function words. Signs invented within Manually Coded English were not counted as equivalent. Only the uninflected English form (e.g., COME) was counted, forms with inflections were not counted as having a common ASL sign equivalent (e.g., CAME). In general, the determination was a highly conservative estimate of word-sign equivalents.
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