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Learning English from Signed English: An Impossible Task?

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Learning English from signed English: An impossible task?

Abstract

A sample of elementary and high school-age deaf students in special education programs in the Australian state of Queensland using Australasian Signed English (ASE) undertook the *Test of Syntactic Abilities* and wrote a story in response to a wordless picture sequence. A number of analyses of the test scores and of the written language of their stories was undertaken. It was found that classroom use of ASE was of benefit to these students in developing English and telling a story in writing but that there are complex aspects of syntax that require special teaching. The implications for the use of signed English systems and the teaching of English to deaf students who use signed English communication are examined.

Learning English from signed English: An impossible task?

After the Milan Congress on Education of the Deaf in 1880, the prevailing philosophy and practice in education of the deaf was that of oralism—driven by the belief that deaf people needed to be able to speak and fit into hearing society

(Brill, 1984; Lang, 2003; Moores, 2001). There were a few exceptions in some countries, notably some residential and day schools in the United States of America, Britain, and Australia and a small number of schools in Europe which continued to use signing in one form or another. Signing was often used under a “Combined System”, which provided separate oral and signing classes within the one school, or the “Combined Method”, which used signing and speech together in class—the signing usually being a form close to that of the local spoken language rather than a natural sign language (Moores, 2001; Schick, 2003). The oral approach largely prevailed until the emergence of “Total Communication” (TC) in the 1960s (Evans, 1982) when dissatisfaction with the outcomes of oral education for most deaf students led to the reintroduction in schools of communication which included signing (Jordan, Gustason, & Rosen, 1979, 1976; Leigh, 1995).

In theory, TC provided students with whatever method of communication was deemed best to meet their needs, but in practice its realisation was in “Simultaneous Communication” (SC) in speech and one form or another of what could generically be called “signing in English” or “Manually Coded English” (MCE). In the United States several forms of signing in English emerged: Seeing Essential English (SEEI; Anthony, 1971), Signing Exact English (SEEII; Gustason, Pftzing, & Zawolkow, 1980), the Linguistics of Visual English (LOVE; Wampler, 1971) and Signed English (SE; Bornstein, 1990b). In some countries a single standardised form of signed English was developed and dictionaries published. In Australia (where the present study was located) and New Zealand, this was “Australasian Signed English”¹ (ASE) (Jeanes, Reynolds, & Coleman, 1989; Leigh, 1995; McDougall, 1988).

ASE used existing signs of Australian Sign Language (Auslan), invented signs, and two-handed fingerspelling to reproduce an analogue on the hands of what was simultaneously being spoken. Unlike the American and some other systems, ASE used fingerspelled forms for grammatical features such as regular bound morphemes for number, tense, adverbial force, and nominalisation. Invented signs based on the uninflected form were used for irregular nouns and verbs. SC using this system became the most widely used system of communication in Australian schools and units for deaf students from the early 1970s, and continues to be used in most educational programs that use signing. A number of programs began using bilingual-bicultural approaches involving Auslan in the 1990s and the number of such programs continues to grow. We are not here concerned with comparisons of the two systems or their outcomes.

Since the 1970s a considerable literature has grown up around the use of SC as to its effectiveness in communication and as a basis for developing English. Indeed, some commentary has asked the question of whether it is even possible to produce an accurate signed form of spoken English, with some authors claiming that signing in English accompanied by speech is “an impossible task” (Strong & Charlson, 1984) and a priori the claim that such signing gives

¹ “Australasia” is the term used when considering Australia and New Zealand together. The two countries share many ties, but are not a political union.

students accurate access to English cannot be sustained. Several studies have provided data demonstrating that signing accompanying speech is non-grammatical vis-à-vis English (Kluwin, 1981; Marmor & Pettito, 1979; Wood, Wood, & Kingsmill, 1991) and sometimes unintelligible to its recipients because it violates the naturally occurring visual and movement structures of natural sign languages (Supalla, 1991; Wilbur, 2002). Previous studies by the present authors (Hyde, Power, & Leigh, 1996; Leigh, 1995; Power & Hyde, 1991; Power, Hyde & Leigh, 1996; Power, Leigh, & Hyde, 1998) and others (Maxwell & Bernstein, 1985; Wilbur & Petersen, 1998) have demonstrated that while systematic changes in speech accompanying signing in English make such speech unlike speech unaccompanied by signing (especially as regards suprasegmentals), signed English can be nevertheless an accurate representation of English in the hands of skilled and motivated teachers, at least at lower grade levels (Fram, 1992; Leigh, 1995; Power & Hyde, 1991). However, it appears that there are also changes in the nature and complexity of teacher SC language to deaf students that may not provide them with a wide enough range of grammatical and lexical aspects of English (Leigh & Hyde, 1998). There seems to be a growing consensus that while SC is not “impossible”, it is difficult for teachers to realise exact signing in English in practice in the everyday circumstances of the classroom.

Although some improvements in academic achievement have been noted across the 40 year period in which signing in English has been used systematically in the education of deaf children, it is argued that the results of SC regimes have not led to the improved level of English language learning and academic achievement by deaf students that its supporters had anticipated (Allen, 1986; Bornstein, 1990a; Johnson, Liddell & Erting, 1989; Karchmer & Mitchell, 2002; Praxler, 2000). In this context, another stream of research has examined whether deaf students exposed long-term to MCE systems can learn English from them effectively (Gaustad, 1986; Geers & Schick, 1988; Schick, 2003; Schick & Moeller, 1992; Strong & Charlson, 1987;).

Schick and Moeller (1992) employed a number of measures of the impact of Signing Exact English (SEEII) on the English development of thirteen students in two American Mid-West programs for deaf students. They examined the elicited language samples (including responses to a wordless picture sequence comparable in nature to the present study) of a group of the deaf students and a hearing comparison group. They found that, in comparison to the hearing group, the deaf students produced the same proportions of simple and complex sentences, had the same proportional use of embedded clauses, and used standard English sentence argument structure. However, the deaf students tended to make errors in use of auxiliaries, copulas, and inflectional morphemes for tense and number marking. They concluded that the hypothesis that, “MCE systems are unlearnable ... cannot be supported [but] ...it may be true that certain aspects [of English] are difficult to learn [from MCE systems] (p. 337)”. They also concluded that, “some aspects of English appear to be learnable via an MCE system, but that other aspects might indeed be difficult to learn (p. 337)”.

In summary, there have been few studies in the literature that have specifically examined the features of English language learning by deaf students who have received sustained exposure to signed English. In most cases studies have continued to focus on the capacity of teachers or parents to produce complete forms of signed English (e.g., Hyde, Power & Cliffe, 1992; Kluwin, 1981; Leigh, 1995; Marmor & Pettito, 1979), the effects on each other of the signed and spoken components in simultaneous communication (Hyde, Power, & Leigh, 1996; Whitehead, Schiavetti, MacKenzie, & Metz, 2004), the perceptual conflicts between signed and spoken elements (Gee & Goodheart, 1985; Supalla, 1991), or the potential for language mixing between signed English and a natural sign language to produce gains in literacy (e.g., Vernon & Andrews, 1990). It has been reported that learning of English through signed English is either “impossible” due to difficulties in its production by teachers and comprehension by students or, in complete contrast, it is “assumed that deaf children will acquire English naturally through seeing it” in its manually coded form (Andrews, Leigh, & Weiner, 2004, p. 150).

Notwithstanding the shift of a number of programs to the use of natural sign languages in instruction in sign bilingual programs (Johnson, Liddell & Erting, 1989; Mahshie, 1995; Strong, 1995; Svartholm, 1993) over a period of more than 15 years, SC continues to be widely used and the research and practice questions regarding the effects (especially on the development of English) of sustained exposure to SC remain relevant. This study therefore examined the English competency outcomes of sustained exposure to ASE in SC in Australian school programs.

Method

In order to examine the impact of the use of SC (with ASE as the signed component) upon their development of English, students from two high and two elementary school units for deaf students in a major metropolitan city in Australia were tested with a number of techniques for evaluating their development of English. Data were collected on pupil, teacher, and home variables that might be related to that development.

Subjects

Students. Subjects were drawn from four special units for deaf students situated in regular high and elementary schools in a major metropolitan area in Queensland, Australia. They ranged in age from 10 to 17 years and in were in “nominal grades” from 5 to 12. In Queensland high school contains Grades 8-12. There are no middle schools or junior high schools. There were 14 students in the elementary grades (7 girls) and 31 in high school (19 girls). All students were described by their educational service providers as being within the normal intelligence range. Two were from homes where little English was spoken and four from homes where Auslan was the main language of communication. A few were following the regular curriculum in some subjects in regular classes but most followed specially designed Individual Education Programs—often based on the regular curriculum—within the special education unit. Almost all the high school students had attended special units for deaf students in elementary school and many of the high and

elementary school students had attended a special preschool for the deaf that also used ASE in SC. Hence, most subjects had received long periods of instructional exposure to ASE.

Teachers. There were seven teachers involved in the study. All were hearing. Each responded to a specially devised questionnaire about their teaching experience, whether in regular schools or deaf education settings and their experience in using SE in SC.

Data collection instruments

Students. Instruments included the *Test of Syntactic Abilities Screening Test Form 2 (TSA)*; (Quigley, Steinkamp, Power & Jones, 1978), a story writing task utilising as a stimulus a series of pictures showing children breaking a house window while playing street cricket, and a purpose-developed teacher-completed questionnaire about the students' exposure to SC at school and home, aspects of the students' general academic achievement, and ratings (out of 100) of the students' development of written, signed and spoken English in particular. Due to occasional absences from school on testing days and incomplete forms, not all measures were available for all students.

Teachers. Teachers were asked about their experience of teaching deaf students and in using SE to do so. They each self-rated their proficiency in its use, providing a score out of 100 to indicate their perceived proficiency. They also completed two questionnaires; one assessing their knowledge of the principles and rules of the ASE system (Leigh, 1995), and the other measuring the extent to which they had positive attitudes towards the use of the system with deaf children in pedagogical contexts (Leigh, 1995; Leigh & Hyde, 1996). The former was included because of the high likelihood that limitations or inconsistencies in teachers' knowledge of the principles of a particular system for signing English will have a significant influence on the quality of their signing behavior (Leigh, 1995; Stewart, 1992). The latter was included in recognition of the potential impact of teachers' attitudes on their signing behavior (Leigh, 1995; Mayer & Lowenbraun, 1990; Stewart; 1992). Indeed, Gustason (1983) argued that "the biggest question in the effective use of Manual English, or of ASL, other than that of skill, is that of attitudes" (p. 166).

Results

Students

INSERT TABLE 1 ABOUT HERE

Test of Syntactic Abilities. Table 1 presents the students' results on the *TSA*. Because of small numbers in age categories, scores are collapsed into elementary and high school groups. Scores are provided in mean percentage of items correct for each of the syntactic categories. It can be seen that scores ranged from 86% to 52% correct. Surprisingly, and perhaps as an artefact of the relatively small sample, the elementary school group scores

higher than the high school group, although this difference does not achieve statistical significance ($t(33) = 0.33, p = 0.3717$).

It can be seen that the overall ranking of difficulty of these categories of English syntax are similar for both groups, with only minor differences between them ($\rho = 0.8954, p < 0.01$; one-tailed test). Numbers in age groups were too small to allow for stable inferential statistical comparisons, but it is interesting to note that the ten-year-olds scored higher on three of the subtests than any of the older groups.

It is possible to compare the overall difficulty of the structure of scores in the Australian groups with that of the American norming sample (percentages derived from Quigley, Steinkamp, Power, & Jones, 1978; Table 63, p. 97). The Australian group scored higher on all subtests. The overall mean of the American sample was 56% correct and for the Australian group it was 62%. There were some differences in difficulty of structures between the two samples, especially for Complementation, Conjunction and Verb Processes. The rank order correlation between the American and Australian difficulty ratings was 0.64, which, although substantial, failed to achieve statistical significance using a two-tailed test because of the small sample ($n = 9$) available.

INSERT TABLE 2 ABOUT HERE

Table 2 provides means for the elementary and high school groups on the *TSA* total score, Type-Token Ratios (TTRs) calculated on the written stories, and teacher ratings of the students' signed English Environment and of their written, spoken and signed English skills. "SE Environment" is the teacher rating of the quality of school and home access to signed English over the five years preceding the time of testing. "Written English", "Signed English" and "Spoken English" are the teacher ratings of the level of the written, signed and spoken English of the students at the time of testing. It can be seen that the elementary school group scored higher on all variables except the TTR, but the only one of these differences which achieved statistical significance was that for the rating of the overall quality of the students' signed English environment in the five years preceding the testing.

Table 3 provides data on a number of relationships among these variables. Group sizes upon which correlations were calculated in Table 3 differ because of missing data for some variables.

INSERT TABLE 3 ABOUT HERE

There are significant correlations between SE Environment and written and signed English, negative in the case of age and grade, but not with spoken English. It would appear that the quality of the signed English input to the students is reflected in teacher judgements of the students' level of achievement on these variables. It is therefore surprising that there is not a significant association between SE Environment and *TSA* Total Score, given the significant associations among rated SE and the *TSA* score and rated written and signed English skills. This negative relationship between these variables is also found with teacher ratings of the students' level of accuracy of signed

English and the association between these variables, and the *TSA* score, while not negative, is low and not statistically significant.

It can be seen that significant associations exist between *TSA* Total Score and the level of written, signed and spoken English of the students, but not between *TSA* score and age or grade level or rated SE Environment. As would be expected, there is a significant positive correlation between *TSA* Total Score and teacher ratings of written and signed English and between ratings of Signed English and other variables.

All relationships between teacher ratings of student use of SE and other variables (SE Environment, *TSA* Total Score, written and spoken English) are statistically significant (negatively so in the case of age and grade). Of note is the low but significant correlation between Signed English and Spoken English.

Table 4 presents correlations between individual subtests of the *TSA* and teacher ratings of the SE skills of the students. Although all correlations are statistically significant it can be seen that the grammatical structures vary in their association with rated SE skills. ASE may well have more influence on the learning of some English syntactic structures than others.

INSERT TABLE 4 ABOUT HERE

Written Story Task. Table 5 presents summary statistics for the performance of students on the written story task. Students were asked to write a story based on a wordless picture sequence showing a group of children playing cricket in the street and smashing a window with the ball. The owner of the house, a man, is at first angry with them, but then relents and accompanies the children to a park where they can play safely. A number of measures of the stories so produced were calculated. Included were number of words, number of sentences, number of propositions, spelling and grammatical errors, and the presence/absence of a number of complex characteristics of English syntax (following Schick & Moeller, 1992). Type-Token Ratios were added as a measure of the students' diversity of use of vocabulary.

INSERT TABLE 5 ABOUT HERE

The stories ranged in length from 36 to 282 words with a mean of 108 words and contained from one to 18 sentences, with an overall mean of 6.4. Sentences ranged in length from nine to 132 words with a mean sentence length of 14 words. For this analysis "Sentence" was narrowly defined as a group of words ending with a period. Number of words per sentence was thus distorted by the occurrence of ten stories that had no punctuation and were treated as one sentence. With these ten scores excluded more realistic calculations found mean words per sentence was twelve and mean number of sentences eight.

Propositions. Of interest also is the number of "propositions" (distinct idea units) used by the students in their stories. This provides a better measure of the creativity of the writers than the number of sentences. Two of the

authors independently coded the stories for propositions and compared results, finalising an agreed list. There were 619 propositions in total, the mean being 15.2 per story and the range 7 to 44.

Type-token Ratio. A measure of vocabulary and its range of use by children is given by the Type-Token Ratio (TTR; the ratio of the number of different words used to the total number of words used; Owens, 2004). TTRs were calculated for each child's written story and analysed by level of school. Correlations were calculated between TTRs and relevant independent variables. The mean TTRs are presented in Table 5. For the elementary school students, the mean TTR was 0.65 (range: 0.54 – 0.93), for the high school students it was 0.64 (range: 0.43 – 0.81).

None of the differences in mean scores between the elementary and high school groups on these three measures was statistically significant.

Spelling. Deaf children's spelling has been reported to exceed their other literacy skills from an early age (e.g., Marschark, Lang, & Albertini, 2002). Our subjects made relatively few spelling errors. They averaged only 1.4 errors per story and if one outlier who made ten errors was omitted from the calculations, only 1.1 errors per story. Eleven (of 40) made no errors and another thirteen made only one error.

Written language analyses. We replicated a number of Schick and Moeller's (1992) analyses for comparison with our data. We found, for example, that there were similarities and differences between their data on pronouns (their Table 5, p. 27) and ours. For all 261 sentences the mean number of Nominative case pronouns (he, we, they, etc.) in our data was 62% (vs 87% for Schick & Moeller), Accusative case pronouns (him, us, them, etc.) for us was 20% (vs 25%), and Possessive case pronouns/adjectives (almost all were Possessive adjectives, his, our, their, etc.) was 13% for us (vs 21% for Schick and Moeller). Schick and Moeller did not report on Reflexive Pronouns, and we found only one use of this case (yourself).

Schick and Moeller also analysed the use of copulas and auxiliary verbs. Like Schick and Moeller's deaf subjects, ours did not avoid using auxiliaries and copulas. In 58% of our subjects' sentences one or more auxiliaries and/or copulas were used (Schick & Moeller; 46%). The range of use by our subjects was 0-10 per story. The percentage of missing auxiliaries or copulas among our subjects' data (0.8%) was noticeably different from Schick and Moeller's (21%). Schick and Moeller did not report incorrect use of auxiliaries and copulas but our analysis revealed 26 errors, of which 54% were incorrect number matching of subject and auxiliary/copula (e.g., "the boys was ..."; "the girls is ...", etc.), 24% were incorrect matching of auxiliary and verb form (e.g., "was insisted", "have play"), 19% were omission of the compulsory "-ing" marker on the verb accompanying a be-form of the auxiliary, and 4% were errors of tense.

We also compared our data with that of Schick and Moeller on the use of and error rate among common inflectional morphemes—past tense (-ed), present progressive (-ing), third person singular verbs (-s), plural (-s) and

possessive case on nouns (-'s). Our results were again both similar to and different from Schick and Moeller. For past tense marking we had 100 occurrences with a 16% error rate (vs Schick & Moeller: 112 and 27%), for progressive marking we had 60 occurrences and 28% errors (vs 35 and 13%), for plural on nouns we had 69 occurrences and 6% errors (vs 57 and 29%), for third person singular we had six occurrences and no errors (vs 25 and 32%), and for possessive marking we had eight occurrences and 38% errors (vs ten and 39%). In total, we found an error rate of 18% for the five morphemes versus 28% for Schick and Moeller.

INSERT TABLE 6 ABOUT HERE

We also repeated Schick and Moeller's analysis of sentence structures present in the students' stories. They classified sentences as "Perfect" (no grammatical errors), "Near-Perfect" (the only errors were in bound morphology or articles), "Structurally Intact" (the only errors were in bound morphology, articles, copulas and auxiliary verbs) and "Propositionally Intact" ("the meaning of the sentence was clear, whether or not it followed the exact rules of English"; p. 322). Table 6 presents the data comparison for means for Schick and Moeller's sample (their Figure 1, p. 325) and ours. In Table 6, the data in each column are accumulated in the next column total. It can be seen that our sample produced slightly fewer sentences in each category of sentence structures than did Schick and Moeller's. There were only minor sentence type category differences among our sample students on the basis of school level, the elementary school students performing only slightly less well than the high school students. Schick and Moeller set a criterion of achieving 80% of "Perfect" sentences in their stories. There were no differences between our sample and that of Schick and Moeller on the criterion of achieving 80% Perfect sentences in their stories—15% in both cases.

Teachers

Seven teachers (all hearing) responded to our questions about their students. They were a very experienced group. With the exception of one recently appointed teacher with fewer than six months' experience, their service ranged from seven to thirty years with a mean of sixteen years. In the teaching of deaf students, their experience ranged from seven to twenty-five years with a mean of fourteen years. Their experience in using ASE ranged from seven years to twenty-five with a mean of thirteen years.

We asked the teachers to rate themselves (out of 100) in their skill in using ASE. Six responded and all believed themselves to be highly skilled. The range of their self-rating was from 75/100 to 85/100 with the mean at 81/100. We also asked the teachers to complete Leigh's (1995) questionnaire on the characteristics of ASE and five did so. In Leigh's (1995) study 30 teachers scored, on average, 82% for their knowledge of the rules of use of the system. In comparison, four of the five teachers in the current study demonstrated low average knowledge of the

principles of use of ASE, averaging 72% correct on the questionnaire; one had quite idiosyncratic views and scored only 38% correct.

Five of the teachers completed Leigh's "Beliefs about SE" attitude scale—a five-point Likert Scale. Teachers' attitudes were reasonably positive, with the mean response of 3.7 on the scale. This is the same as the average of 3.7 for the 182 teachers of deaf students sampled by Leigh (1995) with the same instrument.

Discussion

The TSA and other measures' results (Tables 1 and 2) present some interesting findings; particularly that the elementary school students scored as well overall as the high school group. It is noted that the mean difference on teacher ratings of the previous five years SE Environment of the students in favor of the elementary students achieved statistical significance and this superior environment may well explain some of the high scores of the elementary students. Possibly also the influence of systemic factors such as the policy of the education authority to move students with the best academic results from special units into regular classes contributes to the superiority of the elementary students as they would be less likely to have been moved out of special units during those years. It also seems likely that there are differences in approach to and use of ASE in SC between the elementary and secondary units, perhaps due to the necessarily greater attention that must be paid to curriculum demands in the high school. Certainly, it has been shown previously that teachers at the secondary school level have far greater difficulty in sustaining compete and accurate representations of English in a signed form as part of SC (Leigh, 1995; Leigh & Hyde, 1996).

The relative order of difficulty of the TSA syntactic structures is quite similar for our elementary and high school groups ($Rho = 0.895$; $p < 0.01$). It would appear that the influence of ASE on the learning of syntactic structures is consistent across these age groups and reflects the relative difficulty of these structures for deaf learners. In particular we note the difficulty with complex processes such as relative clauses, nominalisation and verb processes (the ever-present difficulty with number and tense marking, modals, etc.). We had been interested to see if ASE's use of fingerspelling to represent the written English forms of these elements of inflection compared with the American systems' use of signs for them would be of benefit in their learning these elements (see Leigh (1995) for a discussion of the differences in the systems). However, it seems that fingerspelling of these features did not confer any readily apparent advantage over the American systems' use of signs in these contexts.

There are some differences in the order of difficulty of the subtests between our results and those of the American norming sample (the rank order correlation between our combined groups and the American sample is 0.639 ; $p < 0.05$). It would be difficult to attribute these differences to any particular influence as the American norming sample was more heterogenous than ours (Quigley, Steinkamp, Power, & Jones, 1978), containing students

being educated orally as well as under SC methods. The varieties of MCE being used in the USA were also different among their sample.

The correlations among a range of variables are presented in Table 3. Of particular interest are those among the teacher-rated student Signed English skills and the rated quality of the student's school SE Environment, Written English, and *TSA* Total Score. It seems clear that the quality of the SE Environment that the student is exposed to is reflected in the significant positive associations between this variable and a number of measures of English development, specifically written English, which also correlates significantly with *TSA* Total Score and with individual *TSA* structures tested. It would appear that SE rating also has a low but significant relationship with Spoken English. There is no evidence here that the use of SimCom adversely impacts upon the students' spoken language. Because of the higher scores of the elementary school students there are only very low, and in some cases negative, relationships with age and grade.

The stories analysis demonstrated that the majority of the students were well able to effectively "tell the story" of the picture sequence. None departed significantly from the events in the sequence and a number provided creative embroidering on the events (one writer used his teacher's name as that of the "grumpy old man"!). Some of the mechanics of writing need further attention from their teachers (e.g., punctuation, capitalisation) and we have seen that some aspects of English morphology traditionally difficult for deaf learners (e.g., tense marking, number agreement and auxiliary use) and complex syntax (e.g., relative clauses) continue to present difficulties.

In many ways the simple counts of number of sentences and words per sentence do not do these writers justice. The "propositions/ideas" analysis (Table 5) indicates that many went beyond the bare facts of the pictures and had a sense of telling a story and writing more creatively and elaborately for an audience, an important aspect of written English development (Kirsch & Roen, 1990). As far as the pragmatics and semantics of their writing are concerned, these students demonstrate a quite well-developed sense of what is required. Even with the morphological and syntactic errors present, their stories were easily interpreted.

Our TTR analysis (Table 5) confirmed the relative maturity of these students' capacities as far as vocabulary is concerned, with the mean TTR for the combined groups being 0.65. Klee (1992) is reported by Musselman and Szanto (1998) as accepting the TTR as "a widely accepted [index] of linguistic functioning" and finding a widespread level of TTR as being 0.50. Musselman and Szanto found a mean TTR of 0.47 for their sample of adolescent deaf students writing a letter. Their auditory/oral education group had a mean TTR of 0.46 and their "signing" (SimCom or ASL) group mean was 0.48. Schick (1997), analysing the same data as that of Schick and Moeller (1992) in her NARR (Narrative) condition, the closest condition to ours (though collected in SC rather than writing) found a TTR in that condition of 0.27.

It has been stated by some commentators (e.g., Leigh, 1995; Leigh & Hyde, 1996) that one problem with the use of SE systems is that because of their relatively limited range of signs and the quite limited use of fingerspelling by teachers, students are exposed only to a limited range of vocabulary. The relatively high TTR as an index of lexical diversity found in these students may somewhat allay this concern, but more research is needed in this area. In particular, there is a need to consider a larger written language corpus across a broader range of academic domains.

Schick and Moeller found that some more complex structures of English appeared to be easier to learn than others. They hypothesized that “certain aspects of the language may be more difficult to transfer to a visual modality (p. 336). ... some aspects of English appear to be learnable via an MCE system, but ... other aspects might indeed be difficult to learn (p. 337)”. Our data support this hypothesis. It can be seen that, of the complex English syntactical structures tested in the *TSA*, some appear to be more difficult to learn than others. The capacity to choose correct negative and question structures, for example, seems to be well developed in our students, whereas verb processes and complex relative clauses present greater difficulty. Most structures fall into an intermediate range of difficulty. There is support in these findings for teachers using any form of signed communication to teach English to pay special attention to the more difficult structures, devising special lessons along the lines of those used by teachers of English as a second language to model these structures and improve the performance of these deaf students on complex English structures (see Paul, 2001 for an extended discussion of approaches to methods of teaching language to deaf students; <http://www.webcitation.org/5MpuMOZ65> provides useful resources and links).

There are similarities and differences between our findings and others reported in the literature on this topic. We have made some detailed comparisons between our results and those of Schick and Moeller (1992). As with us, Schick and Moeller found different rates of progress for different English structures. Some appear to be more difficult to learn than others. This is not surprising and mirrors the findings of hearing learners of English as a second language (Paul, 2001; McAnally, Rose & Quigley, 1994). It seems likely that some of these differences could be accounted for in teaching practices, some to non-school exposure to English, and some to differences among various systems used for signing in English. The role of such factors requires further investigation.

Overall, it does appear that ASE is of benefit to these students in the development of a range of their written English skills. However, a point often overlooked in evaluating the impact of MCE (or any school learning, including communicating via natural sign languages) on English development is that a number of other influences are at work in exposing these students to English. Among these are the teaching of reading and written English at school, engagement in reading and writing at home, access to captioned television, and parental competence in the signed English system and its active use in shared communication contexts.

A number of programs for deaf students have adopted the use of the local natural sign language in the “bilingual/bicultural” approach to teaching and communication generally. We support the notion of providing deaf students with access to their local sign language and believe that there are social, cultural and academic benefits from using such an approach. We have yet to see, however, a detailed analysis of the outcomes for English development of students in these kinds of regimes, such as has been done by Schick and Moeller and us for SC. It would be of great value to have this kind of research data available. Further, there is clearly merit in consideration being given to the use of signed forms of English (i.e., “English-like” signing if not a full artificial sign system) for pedagogical purposes. It may be that there is real value in the use of such signing for specific language teaching and perhaps for the negotiation of meaning in English language classes through real time (signed and spoken) interaction with more mature users of English. These are all issues which merit continued investigation.

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Table 1

Test of Syntactic Abilities Percent Correct Scores by Grammatical Category

Category	Elementary school		High school		Combined		USA norms	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Negation	86	1	78	1	82	1	71	1
Complementation	71	2	65	5	68	4	49	7.5
Question Formation	70	3	71	2	71	2	63	2
Determiners	69	4	69	3	69	3	56	4.5
Pronominalisation	65	5	68	4	67	5	56	4.5
Nominalisation	62	6	61	6.5	62	6	49	7.5
Conjunction	61	7	61	6.5	61	7	62	3
Relativisation	53	8	59	8	56	8	44	9
Verb Processes	52	9	58	9	55	9	54	6
Overall Mean	65		59		62		48	

Table 2
Group Mean Scores on Rating and Test Variables (%) and TTR

Variable	Elementary	High school	Statistic	<i>df</i>	<i>p</i>
Signed English Environment ^a	85	66	20.5 ^d		0.001
Signed English Rating ^b	76	69	225 ^d		0.076
Spoken English Rating ^b	60	56	213 ^d		0.062
Written English Rating ^b	64	61	227 ^d		0.068
TTR ^c	0.61	0.64	1.06 ^e	49	0.147
TSA Total Score	68	65	0.12 ^e	51	0.452

^aAs reported by teachers

^bTeacher rating

^cActual mean ratios

^dMann-Whitney U test

^e*t*-test

Table 3
Correlations Among Selected Variables

	<i>r</i>	<i>n</i>	<i>p</i>
SE Environment ^a and			
TSA total score	-0.165	28	NS
Written English ^b	0.326	28	0.045
Signed English ^b	0.541	28	0.001
Spoken English ^b	-0.024	24	NS
Age	-0.622	28	0.0002
Grade	-0.583	28	0.0006
TSA Total Score and			
Written English ^b	0.626	43	0.0001
Signed English ^b	0.406	40	0.005
Spoken English ^b	0.527	37	0.0008
Age	0.002	40	NS
Grade	0.101	40	NS
Student Signed English ^b and			
SE Environment ^a	0.541	28	0.002
TSA Total Score	0.399	43	0.004
Written English ^b	0.611	43	0.0007
Spoken English ^b	0.282	43	0.034
Age	-0.326	43	0.016
Grade	-0.267	43	0.042

^aAs reported by teachers ^bTeacher rating

Table 4

Correlations Between Student Signed English Rating^a and TSA Subscores

TSA subscore	mean	rank	<i>r</i>	<i>p</i>
Negation	82	1	0.360	0.010
Question Formation	70	2	0.481	0.0007
Determiners	69	3	0.509	0.0003
Complements	68	4	0.377	0.007
Pronominalisation	67	5	0.570	0.0001
Nominalisation	62	6	0.409	0.004
Conjunctions	61	7	0.450	0.0016
Relativisation	56	8	0.426	0.0027
Verb Processes	55	9	0.378	0.007

Note. N = 41 in all cases

^aAssigned by teachers

Table 5

Means of Summary Variables of Stories

	N words	N sentences	N words/sentence ^a	N propositions	TTR
Elementary	112	6.5	14	16.8	0.65
High school	103	6.3	14	13.5	0.64
<i>t</i>	0.55	0.15		1.5	1.06
<i>df</i>	39	39		39	49
<i>p</i>	0.293	0.441	NS	0.071	0.147

^aExcluding single sentence stories

Table 6
Sentence Structures Found in Stories (%)

Source	Sentence type			
	Perfect	N-P	SI	PI
Schick & Moeller ^a	55	71	80	100
Total present data	39	62	73	92
Elementary	38	58	72	100
High School	40	67	75	92

Note. Percentages are added inclusively across columns in each row.

N-P = Near-Perfect; SI = Structurally Intact; PI = Propositionally Intact

^a Schick, B., & Moeller, M. P. (1992). What is learnable in manually coded English sign systems? *Applied Psycholinguistics*, 13, 313-340. (Figure 1, p. 325)