

“I Was Born Full Deaf.” Written Language Outcomes After 1 Year of Strategic and Interactive Writing Instruction

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Nonstandard grammatical forms are often present in the writing of deaf students that are rarely, if ever, seen in the writing of hearing students. With the implementation of Strategic and Interactive Writing Instruction (SIWI) in previous studies, students have demonstrated significant gains in high-level writing skills (e.g., text structure) but have also made gains with English grammar skills. This 1-year study expands on prior research by longitudinally examining the written language growth (i.e., writing length, sentence complexity, sentence awareness, and function words) of 29 deaf middle-school students. A repeated-measures analysis of variance with a between-subjects variable for literacy achievement level was used to examine gains over time and the intervention’s efficacy when used with students of various literacy levels. Students, whether high or low achieving, demonstrated statistically significant gains with writing length, sentence complexity, and sentence awareness. Subordinate clauses were found to be an area of difficulty, and follow up strategies are suggested. An analysis of function word data, specifically prepositions and articles, revealed different patterns of written language growth by language group (e.g., American Sign Language users, oral students, users of English-based sign).

With respect to writing English text that is grammatically accurate and complex, deaf writers are known to demonstrate substantial variability in their writing and, subsequently, have different instructional needs than hearing writers. Nonstandard grammatical forms tend to appear in their writing that are rarely, if ever, produced by hearing students, even in the writing of hearing students with very limited school experience (Fabbretti, Volterra, & Pontecorvo, 1998). This certainly points to the language differences that exist between hearing children

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and deaf children, the former subconsciously acquiring a mental grammar (Jackendoff, 1994) for the English language through meaningful, daily communication with proficient users and the latter having limited to no access to the language via acoustic input.

There are noticeable differences and delays in deaf students’ writings (McAnally, Rose, & Quigley, 1994) such as fewer words (Yoshinaga-Itano, Snyder, & Mayberry, 1996) more incomplete sentences and basic syntactic structures (McAnally et al., 1994) with fewer subordinate clauses (Witters-Churchill, Kelly, & Witters, 1983). Deaf writers tend to use fewer noun-phrase modifiers, and there are more errors compared to hearing writers (van Beijsterveldt & van Hell, 2010) such as phrases with frequently omitted function words. These characteristics give deaf students’ writings the appearance of being choppy, simplistic, and rigid (Marschark, Mouradian, & Halas, 1994).

Even though deaf students may exhibit writing difficulties with both low-level (e.g., syntax) and high-level (e.g., semantics) writing skills (Paul, 1998), the persistent struggle with language among deaf writers is often contrasted with high-level abilities that are seemingly more on par. Musselman and Szanto (1998), for example, found that deaf and hard-of-hearing adolescents (ages 13–17, $n = 69$) scored below the norm but within the normal range for text-level semantics or “thematic maturity” on the Test of Written Language-2 (TOWL-2) standardized assessment. The mean syntactical maturity score, on the other hand, was more than 1 SD below the norm. More recently, Antia, Reed, and Kreimeyer (2005) examined the TOWL-3 writing samples of 110 deaf

and hard-of-hearing students in the public setting, Grades 3–12. Their findings similarly showed students were more adept at story construction, whereas they scored the lowest on contextual language. The majority of students scored in the average or above average range for story construction, indicating that students had the most control over high-level writing skills such as providing main ideas and details and organizing text. In addition to these findings, Yoshinaga-Itano et al. (1996) found no significant differences between the total number of propositions that deaf and hearing adolescents produce in their writing. However, even though deaf students may utilize discourse rules in narrative writing to the same extent as hearing, these may be less apparent to the reader due to overbearing grammatical and lexical disfluencies in the writing (Marschark et al., 1994).

There is some indication that deaf students' correct grammatical usage and complexity improves with age yet may tend to stagnate during the teen years. Powers and Wilgus (1983) evidenced that deaf writers show increased syntactical complexity in their writing between 2nd grade to 6th grade. Although a linear development pattern is typically seen between the ages of 7–12, this trend can start to look different in adolescence around age 12 for all children (Bereiter, 1980). As students reach adolescence, there can be a decline in growth, particularly with rules of English grammar for the deaf (Yoshinaga-Itano & Downey, 1996). Musselman and Szanto (1998) found there were no significant differences in deaf students' scores, ages 13–17, on any of the TOWL-2 subtests, which speaks to the difficulty in boosting writing performance in the teen years. Into adulthood, grammatical accuracy (e.g., omissions of obligatory articles) and complexity of writing (e.g., the number of noun phrase modifiers) of deaf adults are still not comparable to their hearing peers (van Beijsterveldt & van Hell, 2010). More than half of working deaf college alumni views grammar as their major weakness in writing, and employers point to clarity of message as a weakness (Biser, Rubel, & Toscano, 2007).

Writing Interventions

Whereas we have come to know quite a bit about the characteristics and trends of deaf students' writing,

there is less information about successful writing approaches, especially when it comes to making a difference with English grammar. In the past few decades, approaches to writing have begun to move away from grammar instruction or structured language programs. Harrison, Simpson, and Stuart (1991) argued for a communicative approach to writing whereby deaf and hard-of-hearing students have the opportunity to express themselves and communicate their ideas through purposeful writing, rather than teachers using writing as a sole means for engaging in grammar instruction. They claimed students develop confidence and fluency of expression rather than being fearful of persistent critique and that children naturally acquired more sophisticated language rules in their writing. Out of 86 students (ages 5–17) exposed to this approach, slightly more than half demonstrated advanced writing skills, with occasional or no syntactical errors in their writing. Yet, the remaining students exhibited frequent syntactical errors and immature constructions, with 13 writing at very beginning and basic levels (not correlated by age). Whereas students with profound hearing losses above 90 dB made up a third of the total student sample, they accounted for 60% of students in the lower three groupings.

In contrast, the regression analysis by Antia et al. (2005) found that hearing loss only accounts for a small amount (4%) of the total variance in writing achievement. Communication mode and time in a general education classroom were also not significant predictors. Only 18% of the total variance could be explained by demographic variables. This may indicate that classroom instruction plays a large role in predicting achievement and perhaps interacts with other demographic variables. Under the communicative approach, it is clear some students flourished, whereas others struggled to make gains in their language and writing.

Kluwin and Kelly (1992) examined the writing skills of 325 students across Grades 4–10 after they had been exposed to 1 or 2 years of process writing. Students' overall holistic quality as well as their grammatical complexity improved beyond the level expected from natural maturation. The authors discussed that students may experience more freedom in their writing and a willingness to experiment with

language when exposed to the process writing approach, rather than being overly concerned with grammatical correctness. In a study by Koutsoubou, Herman, and Woll (2007), a sign language input and translation activity led to greater use of subordination, improved text structure, and story organization, but it also led to greater grammatical error (e.g., omission of function words). Thus, a more ambitious writing effort with regard to semantics and syntactical complexity may result in linguistic structures that are less correct. Based on her study, Mayer (1999) argues that writing instruction needs to be balanced between form and meaning; however, teachers have difficulty keeping this balance because deaf students struggle more with English syntax. Meaning-related aspects of composing such as generating and organizing content are less tied to one's English proficiency and, therefore, may be more readily impacted.

Berent et al. (2007) and Berent, Kelly, Schmitz, and Kenney (2008) implemented a focus-on-form methodology in a 10-week remedial English grammar course for deaf college students at National Technical Institute for the Deaf. Students were exposed to target grammar features in their readings through textual enhancement—the features were in bold and larger print. These grammar items were the focus of some classroom discussions and homework assignments. Students also wrote essays that were later coded with the target grammatical forms, a positive code for successful uses and a negative code for unsuccessful ones. This was intended to support students in noticing their own usage and also reflect on the correct or incorrect productions while revising their essays. A comparison group received traditional grammar explanation, drill and practice, and some comparisons between English and American Sign Language (ASL) features. Students in the treatment groups significantly outperformed the comparison group with mastery of the target forms. Under this instructional approach, one significant difference was that students worked with text that was meaningful to them in the instruction and revision process. However, although grammatical features were the focus of the class and study, little attention was given to high-level writing skills.

To summarize, instructional approaches with writing have started to move away from traditional grammar instruction or structured language approaches to a focus on process writing or communicating through writing. This has worked well to stimulate the semantic maturity of student writing; however, it has had variable impact on grammatical complexity and accuracy. There is some indication that as students become more interested in expressing their ideas in writing and grow in syntactical complexity, their grammar becomes less accurate. Although Berent et al. (2007) did not consider the delicate balance of meaning and form during writing instruction, per se, the fact that the focus-on-form approach was embedded within meaningful and authentic writing could serve as an opportunity to give attention to both.

Strategic and Interactive Writing Instruction

Strategic and Interactive Writing Instruction (SIWI) is the writing instruction used in this study. It combines 20 years of evidence-based research with strategy instruction in writing (Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Graham, 2006) and a substantial foundation of research in interactive writing (Englert & Dunsmore, 2002; Englert, Mariage, and Dunsmore, 2006; Mariage, 1996, 2001; Wolbers 2007b). Because deaf writers tend to encounter writing challenges similar to other L2 writing populations (Wolbers, 2008, 2010), such as grammar irregularities surfacing in their writing, even long after extensive exposure to English (Valdes, 2006), SIWI research is further informed by Krashen's (1994) input hypothesis. Accordingly, persons have two separate routes to developing ability in a first language (L1) or second language (L2): acquiring implicitly and learning explicitly. It is unlikely that one could learn through explicit teaching alone; language systems are too complex to be consciously learned in their entirety, one rule at a time (Jackendoff, 1994). At the same time, studies of L2 acquisition (see Ellis & Laporte, 1997) demonstrate that there is a need for explicit instruction, especially grammatical consciousness raising, which is not necessarily needed for acquisition of L1.

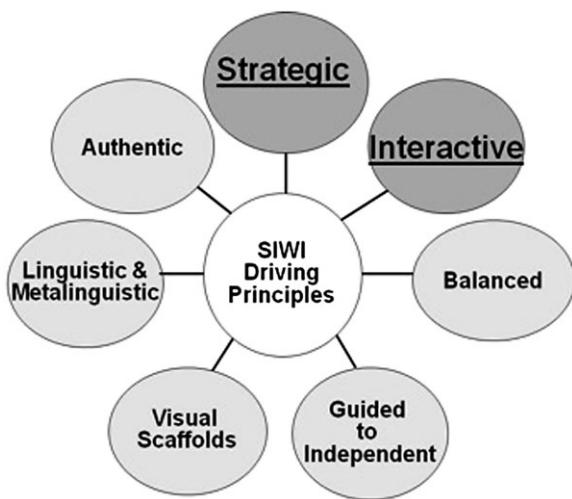


Figure 1 SIWI driving principles.

In all, SIWI draws on literacy practices shown to be effective with all students but also has specialized components that address the unique language needs of the deaf. The seven driving principles of SIWI are presented in Figure 1 and detailed briefly below. See Wolbers (2008) for a more complete description.

Strategic instruction. The instruction is strategic in the sense that students are explicitly taught the processes of expert writers through the use of word or symbol procedural facilitators. For example, the mnemonic POSTER (plan, organize, scribe, translate, edit, revise) prompts students to engage in the writing behaviors of more knowledgeable others that are associated with each of the processes, in a recursive manner.

Interactive instruction. SIWI is interactive in that students and the teacher share ideas, build on each other's contributions, and cooperatively determine writing actions during guided and shared writing. When students offer suggestions, the teacher may ask them to explain *why* they think a certain approach is necessary, *when* they need to utilize it, and/or *how* to do it. Through this process, the student externalizes his/her thoughts in a way that is accessible to and adoptable by his/her peers. SIWI is designed to apprentice students in constructing text through interactive instruction. Through supported practice, students are exposed to the thinking, words, and

actions of more knowledgeable writers and, over time, appropriate the writing strategies and practices they encounter.

Balanced. SIWI is an instructional approach that gives attention to both meaning and form. The teacher identifies balanced literacy objectives for his/her students that are slightly beyond what students can do independently. The teacher is cognizant to target a mixture of high- and low-level writing skills that will be emphasized during guided group writing. Thus, the teacher directs students' attention to the targeted objectives while co-constructing purposeful text.

Guided to independent. Student participants may begin SIWI by relying heavily on the others to create effective text and may contribute only as peripheral members. With gradual transfer of knowledge—as more strategies, approaches, and processes are appropriated—participants are more able to move from guided and shared practice to independent writing of text.

Visual scaffolds. Visual Scaffolds are intended to support students in remembering and applying writing skills or strategies. Visual approaches have been known to contribute to the learning of deaf children (Fung, Chow, & McBride-Chang, 2005), and within writing instruction, they offer another mode of accessing the knowledge of expert writers. Students interact with these tools to actively construct their own understandings.

Linguistic and metalinguistic. SIWI first provides an opportunity for students to acquire English implicitly via a nonacoustic route. For the purpose of revising, students repeatedly read through the constructed text as a group. When students who use sign language read the text, they use *print-based sign*. This is a nuanced and complex way of signing because it calls for students to pay attention to the exact written English and express the corresponding meaning through a manual mode. While reading, the teacher uses one hand to point to the printed text and one hand to sign; students may prefer to also voice or move their mouths to

replicate the words they are reading. Every attempt is made to visually represent the English while avoiding conceptual inaccuracies. Although such a method is deemed too cumbersome for the purpose of communication, it is a way to become familiar with the sound and look of English in its full complexity. Additionally, because students generate the text during collaborative writing using their own ideas, the English is comprehensible and meaningful input.

SIWI also provides opportunities for students to learn English explicitly. The SIWI intervention uses a “two-surface” approach during co-construction of text that is necessary to keep the languages separate and help make distinctions between features of ASL and English. When students generate ideas for the text by offering a close approximation to English, the teacher can write this on the English surface. However, if an idea is offered that is dramatically different than English and cannot be written in English, the teacher can document the idea using pictures, symbols, gloss, or video on the second surface, the *ASL holding zone*. Then, translation discussions can take place with the students to determine how to change their ideas into English text. This is a time when principles of English and ASL are compared, contrasted, or highlighted.

Additionally, there is a feature within SIWI that allows for explicit instruction of specific grammar features called the *NIP-it lesson*. These lessons occur when a teacher first notices (N) the need to directly instruct students on a specific grammar item. The teacher then implements a short lesson apart from the guided group writing and instructs (I) the students in this area. Lastly, the teacher brings the lesson back to the group writing area in the form of a visual scaffold, prompt, or procedural facilitator. With reminders from the teacher when necessary, the component is embedded and practiced (P) authentically in the daily writing. This is where NIP-it lessons depart from the traditional writing mini-lessons (Atwell, 1998) because the lesson becomes a purposeful part of daily guided writing from that point forward. Once students show they have control over the grammar item, the visual scaffold is no longer needed in the writing area.

Authentic. Students publish pieces of text for a pre-determined and authentic audience. Thus, real writing purpose is never divorced from instruction happening in the classroom.

Prior SIWI Studies and Findings

SIWI has been implemented in elementary and middle-grades classrooms with students who have mild to severe hearing losses and who use various communication methodologies such as ASL, speech, English-based sign, or a mixture of these communication modalities. It has also been implemented with students who exhibit severe delays in their primary languages. There is growing evidence that SIWI has a significant impact on deaf students’ language and literacy outcomes.

In an 8-week quasi-experimental study of expository writing at the middle-school level ($N = 33$), students in the experimental group who received approximately 3 hr of SIWI a week demonstrated significantly greater gains with high-level writing skills (e.g., coherence, organization, text structure elements) as opposed to the comparison group. The effect size was at $d = 2.65$ (Wolbers, 2008). Following Cohen’s effect size guidelines, 0.20 is small yet meaningful, 0.50 is a medium effect (i.e., half of a standard deviation difference in means) and 0.80 or above is large (Howell, 2002). The very large effect size in this case was not surprising because the comparison group teacher did not teach expository writing during this time. Rather, students in the comparison classes spent the majority of their time working on grammar-related exercises as well as some letter writing with teacher conferencing. The experimental group also showed significantly greater improvements with high-level skills on a writing prompt similar to the state standardized assessment, resulting in another extremely high effect size of $d = 2.07$. This genre of writing was not explicitly taught in either group, which shows the general impact that SIWI can have on high-level writing skills. At the same time, the experimental group made significantly greater gains and had high effect sizes with grammar ($d = 1.38$), writing fluency ($d = 1.53$), and editing/revising skills (Wolbers, 2007a, 2008, 2010). This was the case even though instruction in the experimental group was balanced and students were equally exposed to meaning and form. And, in the comparison group, where the

curriculum was heavily centered on grammar instruction and little time was given to high-level writing skills, students demonstrated no significant gains in grammar from pre- to postwriting samples. Thus, SIWI has the potential to boost low-level writing skills without reducing focus on high-level skills.

In a short 21-day intervention of interactive instruction (a precursor to SIWI) at the elementary and middle-school levels ($N = 16$), students demonstrated significant gains in high-level writing skills, low-level writing skills, reading, and editing/revising skills (Wolbers, 2007b). Regardless of students' writing ability at the start of the study, ranging from beginner to more sophisticated, all made statistically similar gains with semantics and grammar. Of the 15 different contextual language variables scored according to rubrics, students demonstrated the largest gains with those grammar items given the most instructional and conversational time during guided writing. Although these findings were based on a small number of students over a relatively short period of time, the instruction appeared to improve writing outcomes among less mature and more mature student writers.

Qualitative data have helped to reveal why deaf and hard-of-hearing students at various language and literacy levels make significant progress with SIWI. It was found that the teacher provides instruction that is flexible and responsive to students' unique language histories and needs (Wolbers, 2010). For example, students who are proficient in ASL as their L1 and can automatically code-switch to English-based sign when writing have different instructional needs than students who are growing in their sign competency and do not know ASL and English to be two separate and distinct languages. The first group benefited from the repeated readings of complex forms of English using print-based sign. They also used ASL to engage in questioning, problem solving, and discussing English usage. The second group of students profited from discussions about ASL and English differences, apprenticeship in translation activities, and use of the ASL holding zone. And, these approaches were still different from those taken with students who are severely delayed in their primary language. With these students, the teacher worked to promote shared understanding between members and then support the

expression of ideas in ASL before discussing equivalence in English.

The current study draws on and extends previous SIWI research in three important ways. First, the present research involves a year-long intervention with SIWI that enables a more longitudinal look at written language growth. Second, it aims to expand on growing evidence that SIWI is effective with a variety of deaf and hard-of-hearing students by examining the growth of both low-achieving students and high-achieving students. Lastly, this research provides an examination of developmental language patterns of deaf children who have different language histories and profiles.

Methods

A within-subjects design with one between-subjects factor was used to examine the effectiveness of the writing intervention over the course of 1 school year for both low- and high-achieving writers. The dependent variables examined in this study were writing length, sentence complexity, sentence awareness, and function words. Function word data (i.e., use of articles and prepositions) were further examined according to language groups; students were divided into five various groups (detailed later) according to similar L1 experiences.

Research Questions

1. Do students receiving SIWI make significant gains in writing length, sentence complexity, sentence awareness, and function words over time?
2. Do low- and high-achieving students make significantly different gains over time?
3. In what ways do students with different L1 language experiences exhibit different patterns of growth in function words?

Participants and School Context (Setting)

The study took place at a residential school for the deaf located in the southeastern region of the United States. One middle-grades teacher of the deaf, who had received SIWI training 1 year prior to the start of the study, implemented the writing instruction in

all five of her 6th–8th language arts classes. The teacher is hearing and in her 4th year of teaching in her current position. Her bachelor's degree is in educational interpreting. She worked as a freelance and public school interpreter prior to getting her master's degree in education.

The researcher observed the teacher's instruction seven different times throughout the year and at least once in each class. For purposes of measuring instructional fidelity, the teacher was rated on 27 actionable SIWI principles across 6 subcategories: (a) strategic writing instruction and procedural facilitators (5 items), (b) interactive writing instruction and apprenticeship (11 items), (c) building metalinguistic knowledge (3 items), (d) curriculum and content (2 items), (e) instructional procedures (4 items), and (f) audience (2 items).¹ Principles were measured on a 4-point rubric scale whereby 4 was *strongly agree* and 1 was *strongly disagree* that implementation was occurring. The teacher's scores ranged from 3.809 to 4.0 per observation that shows her consistency in demonstrating the instructional principles associated with SIWI.

The school proclaims a total communication philosophy, whereby it is acknowledged that students' communication modes and methods vary, and instruction is to be accessible to all. This philosophy is enacted through the use of sim-com or simultaneous speech and manually coded English. Teachers are required to use sim-com at all times, which naturally limits their abilities to incorporate ASL in their instruction. SIWI, on the other hand, calls for teachers to incorporate ASL (in addition to English-based sign) in their lessons in order to model and discuss language, thereby encouraging students to develop metalinguistic understanding for the languages they use. In order to abide by the school language policy while simultaneously adhering to SIWI principles of instruction, the teacher used the following techniques: (a) use sim-com to set up demonstrations in ASL and to explain after, (b) repeat and utilize students' ASL expressions, (c) show video of other signers and discuss ASL usage, (d) double or triple sign expressions using ASL and then sim-com or vice versa, (e) utilize a conceptually accurate version of English-based sign, and (f) incorporate several ASL linguistic features in

Table 1 Student demographics by full group and achievement groups

	Total	Low	High
N	29	15	14
Age	13.2	13.2	13.2
Unaided hearing	88 dB	85 dB	92 dB
Aided hearing	35 dB	39 dB	31 dB
SAT reading comprehension by grade level (range)	2.7	2.06 (1.3–2.7)	3.47 (2.5–6.1)

sim-com such as facial and body grammar, classifiers, directional verbs, and use of space.

A total of 29 middle-grades students participated in the study. For the purpose of analysis, the classroom teacher assisted researchers in dividing students into low- and high-achieving groups². These groups were largely based on the students' language and writing objectives at the beginning of the year. There was also consideration of students' reading comprehension scores on the Stanford Achievement Test—Hearing Impaired when grouping. Of the five mid-level students who all had grade-level equivalencies between 2.5 and 2.7, three were placed in the high group and two in the low. Those in the high group could communicate their thoughts and ideas in writing with clarity and those in the low group evidenced many nonsensical statements as well as short memorized sentence patterns. Student data such as age, SAT reading comprehension levels, and hearing loss (dB) can be viewed in Table 1 by full group and by achievement groups. Hearing loss is represented by the pure tone average in the better ear.

The researchers and teacher additionally categorized the students by expressive language in order to compare the writing data of students with similar and different language experiences. The research team defined the groups after learning about students' language histories and discussing the great amount of expressive language variability that existed across students. The teacher initially assigned students to language groups based on language group descriptions below. The research team then came to consensus on language classifications upon reviewing classroom footage and individual student interviews.

There were five language groups—severely language delayed, ASL, English-based sign, sign-supported

Table 2 Student demographics by language groups

	Language delayed	ASL	English-based sign	Sign-supported speech	Contact with ASL
N	7	4	7	6	5
Age	13.2	13.4	12.8	13.9	12.7
Unaided hearing	89 dB	101 dB	96 dB	61 dB	95dB
Aided hearing	32 dB	39 dB	50 dB	24 dB	31 dB
SAT reading comprehension	1.8	4.4	3.0	2.5	3.3

speech, and contact sign with ASL tendencies. Students were considered language delayed if they had extreme difficulty relaying their thoughts and ideas to others in their expressive language. Communication, whether verbalized or signed, was often not understood on the first attempt due to fragmented, cryptic, and nonsensical kinds of expressions. Students were considered to be users of ASL as their L1 if they consistently demonstrated appropriate ASL grammar in their expressions. Students considered ASL users in this study were all exposed to ASL in the home or by being involved in the Deaf community at an early age. The English-based sign category was used to represent students who utilized a form of manually coded English, contact sign or sim-com on a daily basis. Students who mainly spoke, or used sign infrequently to support their speech, were assigned to the sign-supported speech group. Lastly, there was one group of students who did not neatly fit into either the ASL or English-based groups for they exhibited characteristics of both groups. They were assigned to the contact sign with ASL tendencies group. Student demographics by language group can be viewed in Table 2.

Procedure

Throughout the school year, students received SIWI instruction with personal narrative, narrative, expository, and persuasive writing. The personal narrative and narrative genres were taught during the first semester of the academic year, and expository and persuasive writing were taught in the second half of the year. All classes received 3–4 SIWI sessions a week for approximately 45 min each. This was the standard time allocated to English instruction (apart from reading instruction) at the school. The classes engaged in guided, shared, and independent writing, depending

on students' levels of independence with the writing skills and objectives. When new writing skills were introduced (e.g., the learning of a new text structure), instruction would begin in a group setting and then transition to shared and independent writing as students gained more control over the writing process. Authentic audiences and purposes for students' writings were always established prior to writing. Once published, students shared their writing with their readers.

The writing objectives varied by class (and by individuals within each class) depending on language and literacy levels. For instance, classes with more beginning writers may have been working to write simple narratives by describing a sequence of events, whereas the classes with mature writers were working to incorporate more sophisticated elements such as a climax and resolution, dialogue, and character development. Similarly classes varied in their low-level writing objectives as well. Some, for example, needed instruction with constructing basic sentences with a subject and predicate, and others were working on complex sentences and embedded clauses.

Data Sources

Writing measures. Samples of student writing for all four genres were collected at the beginning of the year, the middle of the year, and the end of the year. The personal narrative samples were used for the current analyses. When collecting these samples, students were given as much time as they needed to write about a prior experience. The writing prompt that was read to students asked them to write about a time that they visited a special place, something they did over the summer or break, or any true event that has happened to them. Students were not given any assistance during writing.

Table 3 Coded information and the representative writing skills

Writing skill	Coded and derived information
Length	<ul style="list-style-type: none"> ● Number of T-units ● Total number of words
Sentence complexity	<ul style="list-style-type: none"> ● Mean number of words per T-unit ● Mean number of clauses per T-unit ● % of sentences considered compound ● % of sentences considered fragments ● % of sentences considered undefined or run-on
Sentence awareness	<ul style="list-style-type: none"> ● Articles (% correct, omitted, and incorrect) ● Prepositions (% correct, omitted, and incorrect)
Function words	

Coding procedures. The writing samples were first divided into T-units³ and entered into the Systematic Analysis of Language Transcript (SALT) system. The SALT system, capable of providing automated analyses of spoken language samples on a wide range of language indicators, was utilized in this study to store and code written data. We used the system to generate counts of written language variables such as the number of T-units per sample or number of any coded variable. Twenty percent of the samples were segmented into T-units by two research members with an interrater agreement of 85.9%.

The lower level writing skills that were analyzed include length, sentence complexity, sentence awareness, and function words. Table 3 displays the information that was coded in SALT and/or derived from the SALT analyses to represent these writing skills. For instance, sentence awareness was demonstrated by the percentage of sentences that were coded fragments and the percentage of sentences that were undefined or run-on. Undefined sentences meant that students did not have a clearly marked beginning or end to their sentences. An example of a writing sample entered into SALT with codes for the low-level writing skills can be viewed in Figure 2. Once counts were generated in SALT, percentages could then be calculated. The percentage of articles omitted, for example, was calculated by dividing the number of articles

omitted in a sample by the total number of correct, omitted, and incorrect articles. This calculation was applied to function word data in order to make comparisons across samples, regardless of length.

A four-member team of graduate students worked with the principal researcher to code the writing samples. Training first occurred with approximately 10% of the samples. All members coded the samples individually and then met to compare codes. These differences were discussed, and consensus was reached among all five members of the research team. Another 20% of the writing samples was divided among the graduate students who worked in pairs to compare scoring. Interrater agreement for coding was calculated using Pearson product moment correlations. Both pairs of scorers showed strong agreement ($r = .955, .950$). All differences were discussed by the five-member team until consensus was reached. Agreed upon codes were included in the analyses.

Data Analysis

A repeated-measures analysis of variance (ANOVA) with a between-subjects factor was applied to the data. The within-subjects factor was time (beginning, mid and end of year). The between-subjects factor was level (low and high achieving). Dependent variables included length, sentence complexity, sentence awareness, and function words. These variables are further defined by subcategories found in Table 3. Descriptive statistics were also generated for articles and prepositions by language group because the growth patterns for function words varied among students based on L1 language use and proficiency.

Results

For each dependent variable, the results are presented for the within-subjects main effect (which responds to research question A) and the within-subjects by between-subjects interaction effect (which responds to research question B). Function word data are further detailed according to language groups. See Appendix for pre- and postwriting samples for one low- and one high-achieving student.

T PN-C3-S13-A
 + Name: PN-C3-S13-A

T "About My Summer".
 T I went to TSD [PPC]⁴ >
 T Family learn weekend [F] >
 T I got [AO] card for my name [PPC] then arrive [PPEO] [AO]
 cottage.
 T Bring bags [F].
 T I wait for my friend [PPC] who was there at school [PPC]
 [SC1], >
 T we go to school [PPC] >
 T Then I saw Emily >
 T I run to my friend [PPC] (who) was happy [SC1] .
 T Emily's mom will sign got paper finished, >

Figure 2 Coded writing sample in SALT.

Writing Length

Writing length was defined by the total number of words in a writing sample and the total number of T-units. Descriptive statistics for writing length variables are displayed in Table 4 by achievement group and full group. The test for sphericity was significant for total number of words and the Huynh-Feldt correction procedure was used. Sphericity for total number of T-units can be assumed. Results of the repeated-measures ANOVA demonstrated a statistically significant main effect for total number of words and a large effect size, $F(1.77, 48.01) = 4.78, p < .016$, $\eta_p^2 = .15$. Effect size is provided using the partial eta-squared (η_p^2); it is described as small when less than 0.06, medium when greater than or equal to 0.06 and less than 0.14, and large when greater than or equal to 0.14 (Kinnear & Gray, 2008). The within-subjects by between-subjects interaction effect was not significant,

$F(1.77, 48.01) = 1.91, p < .163$, demonstrating that both low- and high-achieving groups made similar positive gains in the condition over time. Repeated-measures ANOVA also demonstrated a statistically significant main effect for total number of T-units and a large effect size, $F(2, 54) = 4.34, p < .018$, $\eta_p^2 = .14$. Similarly, the within-subjects by between-subject interaction effect was not statistically significant, $F(2, 54) = 2.7, p < .077$.

Sentence Complexity

Sentence complexity was defined by the mean number of words per T-unit, the mean number of clauses per T-unit and the percentage of sentences that were considered compound. Descriptive statistics for sentence complexity variables are displayed in Table 5 by achievement group and full group. Sphericity for all dependent variables except percentage of compound sentences can be assumed. The Huynh-Feldt correction procedure was used for the analysis of compound sentences.

Results of the repeated-measures ANOVA demonstrated a nonsignificant main effect for mean number of words per T-unit, $F(2, 54) = 1.91, p < .157$. The within-subjects by between-subjects interaction effect was also not significant, $F(2, 54) = 2.26, p < .114$. A steadily increasing T-unit length was noted among the low-achieving group from the pretest ($M = 5.46$; $SD = 2.3$) to midtest ($M = 6.82$; $SD = 2.82$) to posttest ($M = 7.17$; $SD = 2.05$), whereas means remained more stable in the high-achieving group.

Table 4 Means and SD for writing length at pretest, midtest, and posttest

Dependent variable	Pretest mean (<i>SD</i>)	Midtest mean (<i>SD</i>)	Posttest mean (<i>SD</i>)
Total words			
Low	53 (92)	80 (52)	102 (103)
High	195 (133)	165 (84)	304 (252)
All students	121 (133)	121 (80)	200 (213)
Total T-units			
Low	8 (11.3)	12.5 (8.5)	12.9 (10.1)
High	22 (13.9)	18.8 (12.1)	33.9 (23.9)
All students	14.8 (14.3)	15.6 (10.7)	23 (20.7)

Table 5 Means and *SD* for sentence complexity at pretest, midtest, and posttest

Dependent variable	Pretest mean (<i>SD</i>)	Midtest mean (<i>SD</i>)	Posttest mean (<i>SD</i>)
Mean number words per T-unit			
Low			
Low	5.46 (2.3)	6.82 (2.82)	7.17 (2.05)
High	8.94 (2.67)	9.22 (2.15)	8.69 (1.33)
All students	7.14 (3.01)	7.98 (2.75)	7.9 (1.88)
Mean number clauses per T-unit			
Low			
Low	1.03 (0.07)	1.10 (0.20)	1.11 (0.19)
High	1.17 (0.18)	1.16 (0.16)	1.17 (0.11)
All students	1.09 (0.15)	1.13 (0.18)	1.14 (0.16)
% of sentences compound			
Low			
Low	4.1 (0.07)	3.7 (0.08)	11.1 (0.20)
High	5.5 (0.09)	5.8 (0.08)	12.6 (0.13)
All students	4.8 (0.08)	4.7 (0.08)	11.8 (0.16)

When an ad hoc analysis of repeated-measures ANOVA was utilized with the low-achieving group only, a statistically significant main effect for mean number of words per T-unit and a large effect size were demonstrated, $F(2, 28) = 4.05, p < .029, \eta^2 = .22$.

For the mean number of subordinate clauses per T-unit, repeated-measures ANOVA did not show a statistically significant main effect, $F(2, 54) = 0.48, p < .622$. The within-subjects by between-subjects interaction effect was also not significant, $F(2, 54) = 0.68, p < .513$.

A statistically significant main effect with a large effect size was demonstrated for percentage of compound sentences using the Huynh–Feldt correction procedure, $F(1.56, 42.12) = 5.37, p < .013, \eta^2 = .17$. The within-subjects by between-subjects interaction effect was not significant, $F(1.56, 42.12) = 0.013, p < .97$, indicating similar patterns of gain among groups.

Sentence Awareness

Sentence awareness was defined by the percentage of sentences considered fragments and the percentage of sentences that were undefined or run-on. Descriptive statistics for sentence awareness variables are available in Table 6 by achievement group and full group. Sphericity for the first dependent variable, percentage of fragments, was assumed, whereas the Huynh–Feldt

Table 6 Means and *SD* for sentence awareness at pretest, midtest, and posttest

Dependent variable	Pretest mean (<i>SD</i>)	Midtest mean (<i>SD</i>)	Posttest mean (<i>SD</i>)
% of sentences considered fragments			
Low			
Low	26 (0.30)	22 (0.23)	17 (0.16)
High	8.8 (0.13)	4.2 (0.06)	1.9 (0.03)
All students	17.6 (0.24)	13.2 (0.19)	9.9 (0.14)
% of sentences undefined or run-on			
Low			
Low	46.3 (0.38)	28.2 (0.26)	26.4 (0.20)
High	28.3 (0.30)	19.1 (0.14)	15.4 (0.13)
All students	37.6 (0.35)	23.8 (0.21)	21.1 (0.18)

correction procedure was necessary for the analysis of undefined or run-on sentences. Results of the repeated-measures ANOVA indicated a nonsignificant main effect for percentage of sentences considered fragments, $F(2, 54) = 2.84, p < .067$; however, there was a significant linear trend in the data, $F(1, 27) = 5.36, p < .029, \eta^2 = .17$, as seen visually in Figure 3. The main effect for the percentage of sentences considered undefined or run-on was statistically significant with a medium effect size, $F(1.73, 46.87) = 3.83, p < .034, \eta^2 = .124$. The within-subjects by between-subjects interaction effect was not significant, $F(1.73, 46.87) = 0.272, p < .73$, demonstrating that both low- and high-achieving groups similarly reduced undefined and run-on sentences over time.

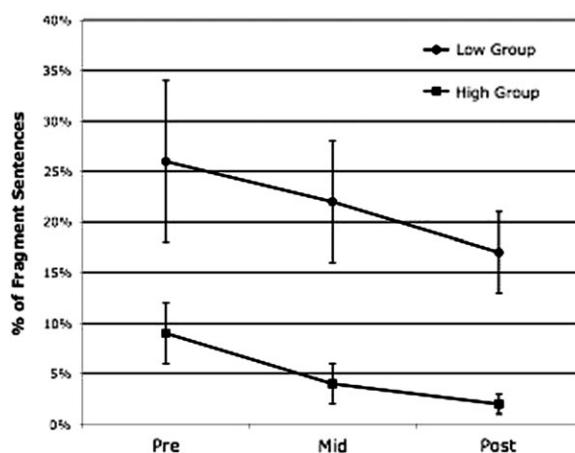
**Figure 3** Percentage of fragments by low- and high-achieving groups.

Table 7 Means and *SD* for articles at midtest and posttest by language groups

Expressive language groups	Feature	Midtest mean (<i>SD</i>)	Posttest mean (<i>SD</i>)
Severely language delayed (<i>n</i> = 4)	Articles correct	0.07 (0.12)	0.17 (0.19)
	Articles incorrect	0 (0)	0 (0)
	Articles omitted	0.93 (0.12)	0.83 (0.19)
American Sign Language (<i>n</i> = 4)	Articles correct	0.39 (0.35)	0.53 (0.21)
	Articles incorrect	0.12 (0.09)	0.12 (0.09)
	Articles omitted	0.49 (0.44)	0.35 (0.18)
English-based sign (<i>n</i> = 6)	Articles correct	0.20 (0.18)	0.28 (0.19)
	Articles incorrect	0.09 (0.14)	0.13 (0.17)
	Articles omitted	0.71 (0.29)	0.59 (0.34)
Sign-supported speech (<i>n</i> = 5)	Articles correct	0.47 (0.33)	0.58 (0.19)
	Articles incorrect	0.21 (0.28)	0.12 (0.13)
	Articles omitted	0.32 (0.28)	0.30 (0.23)
Contact sign with some ASL (<i>n</i> = 5)	Articles correct	0.46 (0.36)	0.22 (0.24)
	Articles incorrect	0.05 (0.07)	0 (0)
	Articles omitted	0.49 (0.32)	0.78 (0.24)

Function Words

The function words category included the percentages of articles that were correct, incorrect, or omitted and the percentage of prepositions that were correct, incorrect, or omitted in student samples. Any sample that contained two total articles (sum of correct articles, incorrect articles and omitted articles) or less was removed from the analyses to prevent skewed percentages that could impact the results. The same approach was taken with prepositions. Nearly half of the pretest samples did not meet the expected criterion, and therefore, only midtest and posttest writing samples were utilized in the analyses.

Twenty-four of the students wrote at least three total articles in both the mid- and posttest samples, and these were utilized in the repeated-measures ANOVA. The main effects for percentage of articles correct, percentage of articles incorrect, and percentage of articles omitted were not significant. For this category of data, it is conducive to examine the results more closely by language groupings.

As shown in Table 7, all but one language group (i.e., the contact sign with some ASL group) successfully increased the percentage of correct articles in their writing and decreased the percentage of articles omitted or incorrect. The severely language delayed group and the English-based sign group had the highest percentages of omissions on the midtest and both showed improvements in this category by posttest.

However, the English-based sign group increased their incorrect articles along with their correct articles. The ASL and sign-supported speech groups showed the greatest amounts of articles correct by posttest. The ASL group made gains by primarily reducing omissions, whereas the sign-supported group decreased the number of incorrect articles in their writing.

Each of the repeated-measures ANOVAs run for the midtest and posttest preposition variables were not significant. The descriptive statistics are provided in Table 8. Although the data show large differences between language groups in terms of the percentage of prepositions correct used in writing, the groups exhibited very little movement from mid- to posttests. Interestingly, the groups with the most preposition omissions on the midtest (i.e., the severely language delayed group, the English-based sign group, and the ASL group) all decreased their omissions by posttest. Decline in omissions among these three groups led to an incline in preposition errors. The other two groups, the sign-supported speech group and the contact sign group, exhibited the highest percentage of correct prepositions at midtest, and demonstrated very little movement.

Discussion

In this longitudinal examination of written language outcomes throughout 1 year of SIWI in Grades 6–8, students made statistically significant gains in writing

Table 8 Means and SD for prepositions at midtest and posttest by language groups

Expressive language groups	Feature	Midtest mean (SD)	Posttest mean (SD)
Severely language delayed (<i>n</i> = 3)	Prepositions correct	0.41 (0.10)	0.37 (0.28)
	Prepositions incorrect	0.17 (0.02)	0.29 (0.08)
	Prepositions omitted	0.42 (0.08)	0.34 (0.35)
American Sign Language (<i>n</i> = 4)	Prepositions correct	0.79 (0.07)	0.82 (0.03)
	Prepositions incorrect	0.10 (0.08)	0.13 (0.06)
	Prepositions omitted	0.11 (0.07)	0.05 (0.04)
English-based sign (<i>n</i> = 6)	Prepositions correct	0.69 (0.14)	0.71 (0.13)
	Prepositions incorrect	0.08 (0.12)	0.12 (0.12)
	Prepositions omitted	0.23 (0.17)	0.17 (0.14)
Sign-supported speech (<i>n</i> = 5)	Prepositions correct	0.86 (0.44)	0.85 (0.12)
	Prepositions incorrect	0.09 (0.06)	0.09 (0.09)
	Prepositions omitted	0.05 (0.09)	0.06 (0.07)
Contact sign with some ASL (<i>n</i> = 5)	Prepositions correct	0.82 (0.19)	0.82 (0.13)
	Prepositions incorrect	0.08 (0.08)	0.06 (0.06)
	Prepositions omitted	0.10 (0.11)	0.12 (0.09)

length, complexity, and grammatical accuracy. Further, statistically similar gains were identified in low- and high-achieving groups of deaf students. Students demonstrated significant growth in their writing skills regardless of their beginning literacy levels or expressive communication method.

In prior research, SIWI has shown tremendous impact on students' high-level writing skills such as organizing and sequencing ideas, constructing text structure that is appropriate to the genre of writing, and responding to the needs of the reader (Wolbers, 2007b, 2008). Although the development of high-level writing skills has been documented, students have also made statistically significant gains in grammar and syntax. The current study extends prior research by examining students' low-level writing skills over the course of one academic year. The current data tell us that students build on what they know and demonstrate continued progress throughout the year with the majority of low-level writing variables that were examined. Gains on these skills were demonstrated in their personal narrative writing, the genre of writing taught in the first quarter of the school year. Because significant gains were made between pre-, mid-, and posttests, students displayed the ability to retain and transfer skills to their writing long after explicit personal narrative instruction. Additionally, the research expands on previous research with data showing all students, regardless of demographics or language and literacy levels, are positively impacted

by the instruction. These findings allow us to see the importance of responsive writing instruction that effectively contextualizes grammar instruction within meaningful, authentic writing experiences.

As an instructional model, SIWI responds to the diverse needs of students in the classroom. The teacher sets writing objectives that are just beyond what students exhibit mastery over in their independent writing, and she/he challenges students during guided interactive writing to incorporate features of these objectives. The teacher may start with heavy modeling and guiding, but, with enough meaningful practice, students gradually take over more of the thinking, talking, and writing associated with these objectives. Because teachers begin by evaluating what students can already do independently and then determining the next logical writing objectives, SIWI can be appropriate and responsive instruction for all. As students take up more control over the writing, the teacher will continuously direct students toward more challenging and demanding goals, thereby fostering further advancement of academic success.

Second, SIWI contextualizes grammar instruction within meaningful and authentic writing, which supports student learning. Prior research has shown it is difficult for deaf adolescents to make gains with English grammar (Musselman & Szanto, 1998; Yoshinaga-Itano & Downey, 1996). Even when the majority of instruction is devoted to the explicit teaching of grammar and syntax, students exhibit little to

no gains over time (Wolbers, 2008). The balanced nature of SIWI allows for less class time to be devoted to grammar instruction, yet students show significant gains in grammar-related areas. When grammar instruction is embedded in student-generated passages where meaning and intent is known, students are more likely to later apply the same grammatical rules in their independent writing. In scripted programs or traditional grammar exercises, students may seem to demonstrate understanding for the grammatical rules or principles but later struggle to apply them in their own writing. In SIWI, students receive contextualized and supported practice with grammar skills within meaningful writing experiences, which helps them to appropriate these skills and transfer them to their independent writing.

Writing Length

Students demonstrated an increased ability to express their ideas at length in English at the end of the year relative to beginning writing attempts. Increases in both T-units and total word counts were statistically significant, and there were no significant differences in the amount of gain that the low-achieving and high-achieving groups made. In fact, the three lowest performing writers at the beginning of the study who wrote 3 words in 1 T-unit, 6 words in 1 T-unit, and 5 words in 5 T-units wrote, respectively, 32 words in 6 T-units, 61 words in 11 T-units, and 91 words in 11 T-units at the end of the year. Similarly two of the highest achieving writers at the beginning of the study wrote 194 words in 37 T-units and 335 words in 26 T-units. By the end, the first student wrote 403 words in 57 T-units and the second student wrote 970 words in 89 T-units.

We suggest the following reasons why students of various writing abilities make gains with writing length when exposed to SIWI. Some students with severe language delays have difficulty with expressive language and writing to share ideas with others. In these situations, teachers utilize techniques such as drawing, gesturing, or using other students as mediators to uncover the intended meanings of their message (Wolbers & Dostal, 2009). Once understood, teachers connect sign language to the student's expression of the experience. In this way, the teacher introduces the student to the

sign vocabulary associated with his/her message. Once they have the language to discuss the event, they can then discuss how to write about it. Teachers have observed that through this process, students grow in their ability to communicate their ideas through expressive language and through their writing (Wolbers, 2010). Other students may have the expressive language ability to share their ideas with others but still experience difficulty moving from the visual spatial mode of ASL to the linear form of English. Through SIWI, these students seem to grow in their meta-linguistic awareness for ASL and English, and they demonstrate greater ability to find English equivalents for their signed expressions. Lastly, because students are writing purposeful text for authentic audiences and are often receiving feedback from their readers, there is a growing desire to effectively communicate their ideas. Students craft their text with the reader in mind and increasingly attend to areas that might impede audience understanding. This, we believe, leads to more complete and detailed personal narratives.

Sentence Complexity

At the beginning of the year, student writing consisted of short simple sentences with an average of seven words per T-unit. Over the year, both high- and low-achieving groups made statistically significant gains in their abilities to coordinate clauses and produce compound sentences. They did this twice as often on postwriting samples than on the pre-samples, which shows that students were utilizing longer and more complex sentences than at the beginning of the year.

In this study, students showed no gains in the number of subordinate clauses they were utilizing in their writing; however, the low-achieving group did show gains in the mean length of their T-units. Hunt's (1965) analysis of grammatical structures, in fact, suggests that the mean length of the T-unit is a more accurate way of measuring sentence complexity. There are other ways of increasing the complexity of sentences by increasing noun modifiers and expanding auxiliary verb phrases, for example. The raters in this study informally observed students using more introductory clauses and transition words in their

writing. Overall, there was evidence of growth among student writing with a shift away from short simple sentences to longer T-units, in addition to more compound sentences.

There is yet a need for an increase in subordinate clauses, an area of great struggle for deaf writers (Witters-Churchill et al., 1983). As students become more mature writers, they typically begin to consolidate clauses without coordination by utilizing more adjectival, noun, and adverbial clauses. At this stage, the T-unit lengthens to 9–20 words a T-unit or more than 20 words a T-unit (Hunt, 1965). In a previous SIWI study, students incorporated more subordinate clauses when complex sentences were taught during NIP-it lessons (Wolbers, 2007a). This reveals a need for instructors to incorporate strategies on how to combine simple sentences and how to form more dependent and relative clauses, for this is an effective writing strategy known to produce moderate effects (Graham & Perin, 2007). Within SIWI, these strategies can be explicitly taught, and students have ample opportunity for supported practice during guided interactive writing.

Sentence Awareness

Both the high- and low-achieving groups showed statistically significant growth in both measures of sentence awareness. By the end of the study, there were substantially less fragments and run-on sentences, and students were much more likely to begin and end sentences using appropriate conventions. It was surprising how little sentence awareness students demonstrated at the beginning of the year; on average, only one of every two sentences was a complete, defined sentence. Through the co-construction of text during guided interactive writing, the teacher would “step in” often to point attention to particular sentences that were not yet complete. Teacher and students would work collaboratively to think through and solve the sentence-related problems. Although it is evident that students have grown substantially in their understanding of a sentence, reducing errors by 25%, it is still an objective area as students are not fully independent with this skill.

Function Words

As a group, students did not show statistically significant gains in the reduction of function word omissions and errors; although, we noted some interesting patterns when examining the data by language groups. For some groups, the decline of omissions led to an incline in errors. The severely language delayed group exhibited this pattern most dramatically when they decreased their preposition omissions from 42% to 34% but increased errors from 17% to 29%. This occurrence has been noted in other research (Powers & Wilgus, 1983)—when students attempt to infuse more language complexity, they exhibit more grammatical error. In this study, many students in the severely language delayed group started the year writing one to two word sentences, supplemented by pictures. By the end of the year, they were writing full sentences and utilizing prepositional phrases. At the same time, in the sign-supported speech group, we found that students’ article omissions stayed approximately the same, but their errors decreased from 21% to 12%. This points to a different pattern of development and possibly different instructional needs because students in this grouping had the least amount of omissions of any group but the largest amount of errors.

Generally, students demonstrated growth in correct usage of articles and prepositions. There is one case when this clearly did not happen. The contact sign with some ASL features group demonstrated a large decrease in correct articles and an increase in article omissions. According to the classroom teacher, all these students were female and in the same class. She saw a larger increase in their motivation to communicate through writing with their audiences as compared to the other classes. At midyear, these students wrote 171 total words on average with 8 total articles. By the end of the year, their samples had an average of 459 words and 27 total articles. During guided interactive writing, students were showing greater independence with articles and the teacher was “stepping back” more often; however, students were not yet fully independent or automatic with this skill. Their interest in sharing their message with the

reader perhaps led to less cognitive attention to articles.

Overall, the function word data allowed us to learn more generally about the English learning needs of various students. First, it is clear that students in all groups have more difficulty with articles than with prepositions. This may be because prepositions seem to carry more meaning for students than articles. And although there are some errors in production, the problem is largely omissions. Throughout the writing samples, the mean use of incorrect articles was only 8.4%, whereas the mean percentage of omissions was 57.9%. For prepositions, 12.1% on average were incorrect and 16.5% on average were omitted. Becoming more proficient in one's use of these function words is actually a two-step process. Students must first come to recognize the need for an article or preposition in their writing. Then, they must choose the appropriate one that meets their needs.

Second, the severely language delayed group made some noteworthy gains throughout the year. At the beginning of the year, students exhibited writing at an emergent or primary level (e.g., writing a few disconnected words accompanied with pictures or a couple patterned sentences listed with numbers). By midyear and end of the year, they were writing paragraphs around a central topic with a mean number of 66 words per writing. At midyear, we were able to start examining the function word data of most students in this group. We found that students omitted nearly all articles and nearly half of all prepositions in their first attempts to write sentences but then decreased omissions by nearly 10% in the latter half of the school year. This was tremendous progress from a group of students who had experienced 6–9 years of school previous to this, whereby the communication approach and/or the instructional approach were simply not effective at producing much gain in written language. These students started the school year at primary written language and literacy levels (e.g., mean reading level of 1.8) but proved that they can make significant progress given an appropriate educational approach.

Lastly, it was surprising to learn that besides the severely language delayed group, the students of the English-based sign group seemed to struggle the most with function words. This group did make progress by

decreasing article omissions from 71% to 59% and preposition omissions from 23% to 17%; however, they were still performing substantially lower than students of the ASL and sign-supported speech groups. Whereas the English-based sign group was performing at 28% articles correct and 71% prepositions correct, the ASL and sign-supported speech groups were at 53% and 58% articles correct and 82% and 85% prepositions correct. Given these differences, one might suggest that the latter groups evidence greater understanding for the English language. The purpose of manually coded English sign systems is to expose deaf children to English through a visually accessible format, and the students in this group were much more likely to see function words as well as utilize them in their expressive communication as compared to ASL users. However, even though the development of English as one's expressive language is the primary objective of English-based sign, there are aspects of English that are simply difficult to acquire through this system in a visual mode (Power, Hyde, & Leigh, 2008; Schick & Moeller, 1992). Future studies might examine this group of students more deeply in terms of gaps that exist in expressive language development. ASL users, on the other hand, have a distinct yet full language through which to communicate about English. Through a contrastive analytic process, they increase their metalinguistic understanding of English and ASL.

Limitations

One limitation to a year-long study is trying to collect post samples at the end of the year. Students endured a series of exams such as the state-standardized assessment, the SAT-HI, the Woodcock-Johnson III, and Bridges post testing—all before writing the four writing samples for this research. In addition, students were anxious to participate in all the fun end-of-the-year events as well as 8th grade graduation. The teacher observed that students were much less interested in their independent posttest writing samples at the end of the year in comparison to the care they took at midyear. Even though we were able to detect several significant gains in the students' writing across time, it is suspected that the gains would have been more pronounced if writing samples were collected before the flurry of other assessments.

The study design has its own set of limitations. Even though there was a considerable sample size of deaf middle-school students ($N = 29$) who exhibited great amounts of language and literacy diversity, the study was limited by the fact that it took place in one setting and with a single teacher. It is recommended that future studies investigate whether high fidelity can be obtained for multiple teacher participants and how similar SIWI interventions might be implemented in the integrated setting. Second, the data on fidelity of implementation were taken by the researcher as there was no other independent observer trained in SIWI instructional principles. Last, due to the design of the study, it is not possible to delineate what gains would have been without the intervention and that some of the reported gains might be based on maturation.

Conclusion

This study demonstrates one teacher's ability (i.e., when adhering to the instructional principles of SIWI) to positively impact the low-level writing skills of a diverse group of students. Throughout 1 academic year of SIWI, deaf middle-school participants demonstrated statistically significant growth in writing length, sentence complexity, and sentence awareness. Additionally, there was no statistical difference between the gains made by students in the high- or low-achieving groups. Some students began the year near the literacy levels of their hearing peers, whereas others were several years delayed performing at beginning language and literacy levels. SIWI was responsive to students' needs regardless of their entry point, and significant growth was demonstrated in the written language of all students. Further, an examination of function word errors and omissions by language group was revealing in terms of the levels of performance by group and the various patterns of written language development across time. In accordance with van Beijsterveldt and van Hell (2010), we see a need for continued research on the developmental patterns of written language of deaf children who have different language histories and profiles. The more knowledge we accrue regarding the diverse language needs that exist among the deaf and hard-of-hearing population, the more suited instruction can become.

Notes

1. The complete fidelity instrument is available upon request.
2. The achievement groups were not necessarily the groups within which they received instruction.
3. A T-unit is the shortest allowable sentence grammatically. It contains an independent clause and any subordinate clauses that cannot survive on their own (Hunt, 1965).
- ⁴Codes: [PPC] preposition correct, [F] fragment, [AO] article omitted, [PPEO] preposition omitted, and [SC1] first subordinate clause.
5. All names and places have been changed to protect the identity of the students.
6. Words in brackets were added by the teacher after asking the student to read their finished writing sample.

Conflict of Interest

No conflicts of interest were reported.

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Appendix

Student Writing Samples⁵

Student 1 Presample

Age: 14 years

Pre-reading level: 2.0

Hearing loss: 95 dB, 40 dB aided

Language group: Severely Language Delayed

Achievement group: Low

I ye————— [yesterday]⁶ go to game football.

Student 1 Midsample

Jason History

Jason enter my house went room then nap for 1 hour. Jason is wakeup and I did see it self open door. Jason won't out my room because I think ghost and me little scared then out room feet same wind. In the morning am 1:20 then Jason sit the chair I feel

more and Jason off the chair. Day 1, Lacy went to room and Lacy yell I see the ghost and Jason was come to Lora' room and Jason saw what want and Lacy say I saw ghost, Jason say that invent. In night Jason sleep my bed I (picture of dreaming person) [dreamt] and nightmare and arrate [arrive] time is am 3:15 is monring then Jason went get drnk wate and back room bed. In now Saturday and Jason day plan for find ghost then Jason can't find and and in Sunday I went church 11:00 to 1:30 and 3:30 I left to plane for school. Coolage I all day sit. Jason went bed room go to bath and sleep look up on light ghost walk. On Monday start for school.

Student 12 Pre-sample

Age: 14 years

Pre reading level: 4.3

Hearing loss: 113+ dB, 40 dB aided

Language group: American Sign Language

Achievement group: High

"My Father"

My mom borned me. And my father Don Boone. I really close to my father til I was 5 years old, and Happened My father died in wreak.. He was driving w/no seatbelt, and He's drunk. He rolled his Car 4 times And He jump out He got cut on his face from fence.. So.. sad!!! That hurts me lot! He makes my mom really happy. He takes us to lake w/ Many friends.

We have wonderful lifes. Now.. We're UNHappy to be w/ my step dad without my real father.

I was VERY derpression for 2 weeks...

When I went to funrel I saw my father I was screaming and CRYED SO HARD.. My aunt comfortable me..

My causin taked me to park.

And take me out eat..

Later on, My Uncle gave me gift. Guess wat.. it was from my father..

He gaved me his blanket I cryed So hard.. I cannot believe he left me.. Well right now I'm alrite I will not never forgetting him

I does LOVES my father!

I got horses I becamed happy..

THE End.

♥'s HORSE!

♥'s Don

♥'s LIFE!

But sad I losted my father..

Student 12 Post-sample

My life

I had sad events in my past life. Now, I have a little sad events right now. My name is Bonnie Boone. I was born in Febuaray 4th, 1994. I born at Clarktown Regional Hosptail. And I lived in Monterey. I was born deaf.

I had a special father name is Billy Don Boone. My father and I were very close. My dad died when I was 5 years old. He was coming back from work, and his car was out control, his car flipped 6 times. He hitted fence with his face. He was still alive. Next day, some person found him and took him to the hospitail. He died when he got there... I didn't know until I go to the funreal home. I saw him in the casket. I began shocked and my heart was torned so badly. I cried really hard.

Later on, my dad's brother died from heart attack. He was with his sister in the truck. Somehow, he start had a heart attack and hit the pole.

My father's mother died from taking much of pills.

She died in Hospitail. She her puppy to me...

My grandpa died front of me. When, I tried get choclate milk and I saw my grandpa fell off from the couch. I screamed and ran to get my mom. She called the ambulance to come. So, I left and went to school. My great grandmother died from a sickness. I cried really hard when I see her in casket and her daugther cried and it makes me heart torned. I remember what happened to my families...

Later, my mom were remarried my second father name is Lance Luke Miller. He's amazing however, he's funny person. My life impoved much better. I met my MOST favorite step sister, name is Diane Miller. Diane and I are very close, and she will alway there for me when I needs her. We grew up together since 11 years.

I moved lived the apartment in Clarktown for 2 years. Then, I move to Olston Co. I live in country farm! Ya! I have 14 horses, many rams, many pigs, four kittens, two puppies, one cat name (Star), and three dogs.

The sad event right now is my parnet don't get along for two years.

My life really difficult for me but I will never forget my families and my life is alright now.