Translation of Thoughts into Written Language in Developing Writers with and without Specific Learning Disabilities

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Abstract

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Two studies were conducted on translating thoughts into different levels of written language—the next sentence (Level I) and the evolving text (Level II). In Study 1, a longitudinal study of typically developing writers, translation strategies were coded at Levels I and II for narrative (cohort one – grades one, three, and five; cohort two – grades three, five, and seven) and expository (cohort one – grades two and four; cohort two – grades four and six) texts for three transcription (spelling) ability groups (poor spellers, average spellers, and superior spellers; 10 girls and 10 boys within each group). The first research hypothesis was confirmed: The coding scheme accounted for all observed translation strategies and reflected some use of multiple ones at Level I or across Levels I and II, consistent with the generative nature of cognitive to linguistic translation. Consistent with the second hypothesis, main effects or interactions with transcription ability were found, especially in cohort one for grades one to five. Study 2 examined whether teaching translation strategies for writing the next sentence, just

before the culminating composing activity (autobiographical texts in first six lessons or summaries of read and heard source material in last twelve lessons) to students in grades four to nine with specific learning disabilities (SLDs), resulted in students' use of these strategies during composing of autobiographical texts (lessons one to six) or summaries about read source material and heard source material, that is, integrated reading-writing and integrated listening-writing, equated for number of words and comparable content (lessons seven to 18). Compositions of the first cohort to complete the computerized lessons (*N*=33) were coded for frequency of use of Level I and Level II translation strategies. Overall, students used many of the taught translation strategies, but individual participant analyses showed considerable diversity among students in which ones they used. Level II translation strategies for cohesion were used significantly more in autobiographical writing than written summaries. Study 1 and Study 2 results are interpreted with teacher voice for translating research into educational practice, for example, by teaching translation strategies for sentences as well as genre.

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CHAPTER 1: INTRODUCTION

Fayol, Alamargot and Berninger (2012) define translation as the transformation of thoughts into written language. They assert that "translation is the fundamental cognitive process of writing" (p. 10) – a process in which writers at all ages and skills will engage. Various disciplines have presented models to account for the translation process.

On the one hand, the influential models of writing, for example by Hayes and colleagues, (Hayes & Flower, 1980; Hayes, 2009, 2012a, 2012b) have emphasized the cognitive processes of writing rather than the linguistics or psycholinguistics of writing. Cognitive processes of writing that have received considerable research attention include planning, translating, reviewing, and revising. But is translating a pure cognitive process or an executive function for facilitating cross-domain communication between the thought world and language? If translating is an executive function for cross-communication between cognition and written language, then what role does transcription (e.g. spelling and handwriting) play in the cross-domain translation process?

On the other hand, the most influential model of linguistics, for example, by Chomsky (2006) has emphasized the generativity of language (from a finite set of words an unlimited number of linguistic structures can be generated) and the deep structures of language underlying it (Chomsky, 2006). But what if cognitions are also generative and the deep structures are not in the language per se but rather in the executive functions that support the translation of thoughts into language? Moreover, translation may operate differently for spoken language, often in conversational registrar, than for written language, often in academic registrar (Silliman & Scott, 2009).

Further adding to the complexity, translation for written texts may operate at different levels of language—word, sentence, and text/discourse levels—and for different purposes—to create cohesion among words within and across sentences or to create coherence among sentences at the discourse level (e.g., Halliday & Hasan, 1976), often constrained by genre requirements. For example, programmatic research based on cross-sectional samples of students in the upper elementary grades (ages nine to 12) showed that developing writers exhibit individual differences in their relative abilities for writing at the word (spelling and vocabulary), sentence, and text levels (Whitaker, Berninger, Johnston, & Swanson, 1994). Thus, individual developing writers may vary in their translation abilities at the different levels of language. Further examination of their writing samples identified translation strategies (algorithms) used to generate the very next sentence in reference to prior text (Berninger, Mizokawa, Bragg, Cartwright, & Yates, 1994). Subsequent research identified text level structures in the compositions of students in grades one to six, which changed across writing development (Berninger, 2012; Berninger, Fuller, & Whitaker, 1996; Fuller, 1995;). However, prior to the current dissertation research, the relationship of these strategies at Level I—the very next sentence—and Level II—the overall discourse structure have not been investigated.

Furthermore, relatively little research has examined the role of transcription in the development of translation strategies for producing written text. However, groups of poor spellers, average spellers, and good spellers across grades one to five or three to seven had been identified in the longitudinal study in other dissertation research (Garcia, 2007; Garcia, Abbott, & Berninger, 2010). The goals of this research, based on the same longitudinal sample, were, therefore, to (a) build upon and extend prior research on how developing writers translate their thoughts into words, sentences, and text by examining the two levels of translating that may

affect writing the next sentence—immediate sentence construction (Level I) and creation of the evolving discourse structure (Level II), (b) examine the generativity underlying cognitive idea generation not just language generation, and (c) consider the role of transcription (poor, average or superior spelling ability) as a related variable that might constrain the translation process.

CHAPTER 2: STUDY 1 RESEARCH AIMS AND METHODS

Research Aims

Study 1 was a longitudinal study (grades one to five or three to seven) designed to address two specific aims in a sample of typically developing writers.

Research Aim 1

The first research aim was to develop a coding scheme that could account for and provide insight into how developing writers translate their cognitions into language during their written composing. The research question investigated whether or not the coding scheme could account for all observed translation categories for Level I (next sentence) and Level II (evolving discourse) structures. All sentences were coded with at least one Level I translation category, but some sentences showed evidence of use of more than one Level I or a Level I and Level II code. The frequency with which each Level I and Level II translation code occurred was computed to generate descriptive statistics to evaluate whether the coding scheme accounted for all observed translation strategies and provided insight into the following:

(a) Algorithms used by developing writers in grades one, three, five, and seven in a longitudinal study of narrative text composing for (1) generating the very next sentence (in reference to text produced so far) (Level I), and (2) constructing a discourse structure for tying individual sentences together in the unfolding discourse (Level II).

(b) Algorithms used by developing writers in grades two, four, and six in a longitudinal study of expository text composing for (1) generating the very next sentence (in reference to text produced so far) (Level I), and (2) constructing a discourse structure for tying individual sentences together in the unfolding discourse (Level II).

Research Aim 2

The second aim of this dissertation research was to evaluate whether the specific translation strategies developing writers used changed across development (grade levels) and varied with transcription (spelling ability). Genre was kept constant across grade levels compared (narrative in grades one, three, and five or expository in grades two and four in cohort one; or grades three, five, and seven for narrative or grades four and six for expository in cohort two). Of interest was whether the frequency of specific kinds of translation categories varied as a function of transcription (spelling) ability. To answer this question, ANOVAs were used with three levels of transcription ability (poor spellers, average spellers, and superior spellers) for those translation categories most frequently observed by developing writers.

For the ANOVA analyses, the translation categories for discourse Level II was further parsed into Level IIA (cohesion within sentence to sentence) and Level IIB (coherence at the genre-level). As a result of the frequency analysis conducted to address Research Aim 1, it was determined that children differed in their use of ties to connect within (Level IIA) and across (Level IIB) sentences at the discourse level.

Methods

Participants

Children were recruited by a University of Washington research team to participate in a five-year longitudinal literacy study that followed two cohorts that overlapped in grades three to five: cohort one from grades one to five and cohort two from grades three to seven. Sixty children from the longitudinal sample were selected for this study of translation strategies during composing (cohort one = 15 males, 15 females; cohort two = 15 males, 15 females). The mean ages of children in their first year of the study were 6.8 years for cohort one and 8.8 years for

cohort two. Both groups were comparable in terms of demographic make-up. In the first cohort, the ethnic identities of children were classified as Caucasian (*n*=21), Asian-American (*n*=8), and Native-American (*n*=1). Their mothers' educational attainment spanned college (60%), graduate degree (20%), community college/ vocational (16.7%), and high school (3.3%). In the second cohort, children's ethnic identities included Caucasian (*n*=21), Asian-American (*n*=7), Black-American (*n*=1), and other (*n*=1). Mothers' educational attainment spanned college (40%), graduate degree (40%), community college/ vocational (163.3%), high school (3.3%), and unknown (3.3%).

Each year the children returned to the university to complete an extensive battery of assessments. Children's overall literacy development fell within the normal range. However, a subsample of sixty children from the longitudinal sample had been grouped within each cohort according to consistent spelling ability levels across the five years: poor (*n*=20, 10 males and 10 females); average (*n*=20, 10 males and 10 females); superior (*n*=20, 10 males and 10 females). Group placement was based on children's scores on the *Wechsler Individual Achievement Test, WIAT –II* (Psychological Corporation, 2001) *Spelling*, given in the first year of the study and repeated in subsequent years. Criteria for the poor spelling ability group required the highest speller in the group to be at ten standard score points below the lowest score of the average spellers; and for the highest score of the average spelling group to be ten standard score points below the lowest score of the superior spellers. Standard scores for the groups were at or below 95 for poor spellers, between 105 and 112 for average spellers, and 122 or above for superior spellers. A previous study based on the same participant samples by Garcia, Abbott and Berninger (2010) confirmed that group membership was reliable across children's five years of participation in the study. That is, a child remained in the same spelling ability group through the

course of the longitudinal study. These groups continued to be separated by at least two-thirds of a standard deviation.

Writing Tasks

In each year of the study, children performed a variety of writing activities across genre. Writing samples for this translational study included narrative texts written when children were in their first, third, and fifth year in the study (i.e., grades one, three, and five for cohort one; grades three, five, seven for cohort 2) and essay texts written in the second and fourth year (i.e., grades two and four for cohort one; grades four and six for cohort two). In the first, third, and fifth years, children wrote about the narrative prompt *One day at school a surprising or funny thing happened.* An additional prompt in the third and fifth year asked children to write about *One weekend at home a funny or surprising thing happened.* During the second and fourth years, children wrote to two prompts: *Explain what a computer is and what it does to someone who has never seen or used one,* and *Explain what a robot is and can do to someone who has never seen one or used one.* These tasks yielded a total of nine writing samples per child. However, because of scheduling conflicts and other difficulties that prevented some children from returning to campus for a particular session, five cohort one and six cohort two children were each missing one writing sample (i.e. a total 11 missing texts or 2% of entire sample).

Coding Unit

Children's writings often lacked ending punctuations to mark boundaries of sentences. In some cases, *then* and *and* served as the only markers for the beginning of main clauses. In this study, the coding units are defined as sentences or main clauses that may include coordinating clauses (e.g. marked by coordinating conjunctions such as *and, but, so, or*) or subordinate

clauses (e.g. marked by subordinate conjunctions such as *after, even though, although, before, because, before, if*).

While a one-to-one match of code and sentence was achieved in most cases, some sentences applied multiple codes. For some of these sentences, use of conjunctions complicated the application of just one code. In others, the sentence simply did not conform to one coded translation strategy, as in this example that applied IA12 *state a wish* and IA16 *If…then statement*: Even if I cant have my dream job I hope I can at least have a job that would keep me on my feet.

Interrater Reliability Studies

Based on prior research on individual differences in levels of language in translation, generating the very next sentence, developmental changes in text structure, and idea generation before composing, a coding scheme was developed and two coders were trained to use it and practiced on 30 samples. Following training the two coders independently coded 10 narrative samples and 10 expository samples. Interrater reliability ranged from .80 to .86 (average .83) agreement.

The remaining writing samples in the longitudinal study were then coded independently by both raters and codes compared. Overall, there was 68% agreement across coders for combined Level I and Level II coding and use of multiple translation strategies in writing a next sentence. Any on which there was disagreement, slightly less than a third, were discussed until agreement was reached. In the process the coding for Level II was refined as it became increasingly apparent that developing writers differed in the extent to which they (a) demonstrated translation strategies at both Level I and Level II as they wrote the next sentence, and (b) showed evidence of using more than one translation strategy in generating the very next

sentence. That is, the disagreements were largely related to coding the parallel Level II translation strategies and use of multiple translation strategies in the same next sentence. All disagreements were readily resolved and the coders agreed the multi-level, multi-process coding scheme for translation strategies yielded insight into the translation strategies of developing writers, which reflect multiple cognitive-linguistic translation processes at multiple levels of written language. See Appendix 1 for final Level I and Level II Coding Schemes.

CHAPTER 3: STUDY 1 RESULTS

To begin with, the frequency of occurrence of each coded translation strategy is reported for each spelling ability group (poor, average, or superior) and grade. Table 1 reports these descriptive results for narrative and Table 2 by expository writing sample. Following each table, a summary of the patterns in these frequency data is provided. These analyses are based on a summary across all participants within a spelling ability group at each grade level at which a specific genre (narrative or essay) was assessed.

Next, based on individual participant data, main effects and interactions for genre and grade were evaluated for specific coded strategies that occurred with some frequency. Results of a series of inferential statistical analyses based on analysis of variance (ANOVA) are reported, for grade effects (developmental change), spelling ability effects (transcription influences on translation), or interactions among them. These results are reported separately by genre and cohort (Narrative, Cohort 1, Table 3; Narrative, Cohort 2, Table 4; Expository, Cohort 1, Table 5; and Expository, Cohort 2, Table 6). Following Tables 3 and 4 is a summary of results for narrative. Following Tables 5 and 6 is a summary of results for expository.

Table 1. Frequencies by Spelling Level and Grade - Narrative Text
(Summarized over all students in each grade level)

Poor Spellers	Gr1 (n=9)	Gr3 (n=19)	Gr5 (n=20)	Gr7 (n=10)
Level I Translation – Write the Next Sentence				
Presyntactic	2	0	0	0
State fact(s)	0	0	3	1
State an opinion/ belief	2	9	2	2
Describe - Paint picture with words	0	5	9	21
Describe state of mind/ feelings	2	2	9	14
Describe function or use	0	0	0	0
Describe observable behavior	6	27	37	21
Tell the next step or procedure	0	0	1	0
Tell next event	4	17	56	53
Tell prior event	0	1	1	1
Define what something is	1	0	0	0
Define what something is not	0	0	0	0
Illustrate - example/counter-example(s)	0	0	0	0
State a wish	0	1	0	0
State a goal/plan	0	1	0	0
Tell a plan for reaching the goal	0	0	0	0
Make a prediction	0	0	0	0
State conditions If…then (may be implied)	0	1	0	1
Pretend/ Imagine what could be	0	1	3	0
Make a comparison (analogy/metaphor)	0	0	1	0
State an outcome	0	1	3	8
Make a statement about time/ space	0	2	5	2
Provide an explanation	0	4	7	4
Qualify a prior statement	0	7	10	6
Evaluate content/organization of writing	0	0	0	0
Repeat part of prior text with substitution	0	1	1	0
Paraphrase prior text	0	0	0	0
Created direct dialogue among characters	0	2	2	1
Create indirect dialogue	0	4	6	12
Pose question for reader	0	0	0	1
Make editorial comment for reader	0	0	1	0
Issue direct/indirect command for reader	0	0	0	0

Table 1 continued. Frequencies by Spelling Level and Grade - Narrative Text

	Gr1	Gr3	Gr5	Gr7
Level II Translation – Connect with the Emerging Discourse Structure in Mind				
Tie sentences with pronoun	2	11	43	30
Tie with a word in a subordinate clause	0	0	4	2
Connect sentences with a single word	0	7	22	34
Tie with a phrase that repeats/constructs prior proposition or content	0	2	4	2
Make a comment that interrupts idea in progress and continues with that idea	0	2	1	1
Narrative Genre: Character	1	2	9	2
Narrative Genre: Setting	0	6	11	5
Narrative Genre: Plot introduction	0	5	13	10
Narrative Genre: Plot in progress	0	21	38	47
Narrative Genre: Plot outcome	0	2	2	8
Narrative Genre: Ending Statement	0	5	10	4
Overall Narrative Translation				
Total Level I Thinking about next sentence	15	86	157	148
Total Level IIA Within same level	2	22	74	69
Total Level II B Across levels	1	41	83	76
Total Sentences	15	76	138	112

Average Spellers	Gr1 (n=9)	Gr3 (n=19)	Gr5 (n=20)	Gr7 (n=9)
Level I Translation – Write the Next Sentence				
Presyntactic	1	0	0	0
State fact(s)	0	1	1	0
State an opinion/ belief	1	4	6	3
Describe - Paint picture with words	3	20	6	4
Describe state of mind/ feelings	1	6	16	13
Describe function or use	0	0	0	0
Describe observable behavior	8	31	45	24
Tell the next step or procedure	0	0	0	0
Tell next event	3	60	79	28
Tell prior event	0	1	2	1
Define what something is	0	0	0	2
Define what something is not	0	0	0	0
Illustrate - example/counter-example(s)	0	1	0	0

Table 1 continued. Frequencies by Spelling Level and Grade - Narrative Text

	Gr1	Gr3	Gr5	Gr7
State a wish	0	0	0	1
State a goal/plan	1	0	3	1
Tell a plan for reaching the goal	0	0	0	0
Make a prediction	0	0	3	0
State conditions If…then (may be implied)	0	0	1	1
Pretend/ Imagine what could be	0	0	0	0
Make a comparison (analogy/metaphor)	0	1	0	0
State an outcome	3	3	11	1
Make a statement about time/ space	0	4	4	4
Provide an explanation	2	7	17	6
Qualify a prior statement	1	8	20	4
Evaluate content/organization of writing	0	0	0	0
Repeat part of prior text with substitution	0	1	0	0
Paraphrase prior text	0	1	0	1
Created direct dialogue among characters	1	12	5	1
Create indirect dialogue	0	11	6	5
Pose question for reader	0	0	0	0
Make editorial comment for reader	0	0	1	0
Issue direct/indirect command for reader	0	1	0	0
Level II Translation – Connect Sentences with the Emerging Discourse Structure in Mind				
Tie sentences with pronoun	3	38	46	11
Tie with a word in a subordinate clause	0	4	9	3
Connect sentences with a single word	1	16	29	8
Tie with a phrase that repeats/constructs prior proposition or content	0	1	3	0
Make a comment that intterrupts idea in progress and continues with that idea	0	2	2	3
Narrative Genre: Character	4	7	15	3
Narrative Genre: Setting	2	11	14	6
Narrative Genre: Plot introduction	1	11	25	12
Narrative Genre: Plot in progress	1	61	84	33
Narrative Genre: Plot outcome	1	7	12	5
Narrative Genre: Ending Statement	2	9	13	10

Table 1 continued. Frequencies by Spelling Level and Grade - Narrative Text

	Gr1	Gr3	Gr5	Gr7
Total Level IIA Within same level	4	61	89	25
Total Level II B Across levels	11	106	163	69
Total Sentences	22	162	209	88

Superior Spellers	Gr1 (n=10)	Gr3 (n=19)	Gr5 (n=18)	Gr7 (n=9)
Level I Translation – Write the Next Sentence				
Presyntactic	0	0	0	0
State fact(s)	1	5	2	3
State an opinion/ belief	1	4	10	4
Describe - Paint picture with words	2	6	12	8
Describe state of mind/ feelings	2	8	14	6
Describe function or use	0	0	0	0
Describe observable behavior	9	36	40	27
Tell the next step or procedure	0	2	5	0
Tell next event	18	64	77	43
Tell prior event	1	2	1	1
Define what something is	0	0	0	0
Define what something is not	0	0	0	1
Illustrate - example/counter-example(s)	0	0	3	0
State a wish	0	2	3	0
State a goal/plan	0	3	2	0
Tell a plan for reaching the goal	0	0	0	0
Make a prediction	0	0	0	0
State conditions If…then (may be implied)	0	0	1	0
Pretend/ Imagine what could be	0	0	5	0
Make a comparison (analogy/metaphor)	0	2	3	0
State an outcome	0	7	9	5
Make a statement about time/ space	2	11	8	1
Provide an explanation	2	6	5	4
Qualify a prior statement	3	13	16	2
Evaluate content/organization of writing	0	0	0	0
Repeat part of prior text with substitution	1	0	0	1
Paraphrase prior text	0	0	0	0
Created direct dialogue among characters	0	16	17	6

Table 1 continued. Frequencies by Spelling Level and Grade - Narrative Text

	Gr1	Gr3	Gr5	Gr7
Create indirect dialogue	2	3	14	1
Pose question for reader	0	0	2	1
Make editorial comment for reader	0	1	2	9
Issue direct/indirect command for reader	0	0	0	0
Level II Translation – Connect Sentences with the Emerging Discourse Structure in Mind				
Tie sentences with pronoun	8	40	38	9
Tie with a word in a subordinate clause	5	12	9	3
Connect sentences with a single word	7	22	23	6
Tie with a phrase that repeats/constructs prior proposition or content	0	1	1	0
Make a comment that intterrupts idea in progress and continues with that idea	2	0	1	1
Narrative Genre: Character	2	15	21	8
Narrative Genre: Setting	2	17	24	12
Narrative Genre: Plot introduction	4	20	30	16
Narrative Genre: Plot in progress	16	83	110	55
Narrative Genre: Plot outcome	0	3	11	7
Narrative Genre: Ending Statement	2	9	22	10
Overall Narrative Translation				
Total Level I Thinking about next sentence	44	191	251	123
Total Level IIA Within same level	22	75	72	19
Total Level II B Across levels	26	147	218	108
Total Sentences	39	156	213	108

Most Frequently Used Translation Categories for Narrative (See Table 1.)

The following summaries are based on all students in each spelling ability group within a grade level for a specific genre in Table 1. Collectively they provide a lens on which translation codes might be used by students in general at each of three spelling ability levels for narratives.

Poor Spellers

For Level I of translating thoughts into written sentences, with the rare exception of one first grader on two occasions, translation resulted in a syntactically complete sentence. Otherwise, in first grade all translation resulted in either *stating an opinion or belief, describing observable behavior, telling the next event,* or *defining what something is*. By third grade, seventeen translation categories were observed, but the most frequent by far were *describing observable behavior* and *telling the next event*. In fifth grade, eighteen translation categories were observed (three new ones—*telling next step in procedure, making a comparison*, and *making an editorial comment*—and three used in third grade were not used in fifth grade—*stating a wish, a goal/plan*, or *if...then conditions*). Again, in fifth grade, the most frequently used translation codes were *describe observable behavior* and *tell next event*. In seventh grade, fifteen translation codes were observed, all of which had appeared in earlier grades, except *pose question for reader*. By seventh grade, of the fifteen translation categories observed, all had been used in earlier grades except *pose question for reader*; the most frequently used translation codes included not only *describe observable behavior* or *tell next event*, as in earlier grades, but also *describe by painting a picture with words* or *describing a state of mind or feelings*. *Indirect dialogue* was also used more frequently than in earlier grades. The number of Level II within and across levels translation categories observed increased from first to third grade and then the

subsequent grades. However, in general, the poor spellers did not tend to apply multiple codes at either Level I or Level II.

Average Spellers

In addition to one presyntactic written language production, first graders showed evidence of using ten Level I translation codes: *stating an opinion or belief, describe by painting picture with words, describe state of mind/feelings, describe observable behavior, tell next event, state a goal or plan, state an outcome, provide an explanation, qualify a prior statement,* and *create indirect dialogue*. However, the most frequently used translation category was *describe an observable behavior*. In addition to these, other translation codes observed in average spellers in third graders included *state a fact, state an opinion or belief, tell prior event, give example, make a comparison, make a statement about time or space, repeat part of prior text with substitution, paraphrase prior text, create indirect dialogue,* and *issue direct or indirect command for reader*; but *state a goal or plan*, as had been used by first graders was not used. Overall at the third grade level, the most frequently used translation categories were *describing by painting a picture with words, describing observable behavior,* and *telling next event*. At fifth grade all the translation codes used by third graders, except *give an example, make a comparison, repeat part of text with substitution,* and *create dialogue among characters*, and *issue command for readers*, were observed, but new ones also occurred—*state a goal or plan, make a prediction, state if…then conditions*, and *make editorial comment for reader*. At fifth grade, the most frequent translation codes were *describe observable behavior* and *tell next step or procedure, qualify a prior statement,* and *describe state of mind or feelings*. At seventh grade, seventeen translation codes were observed, all of which had been observed in third and/or fifth grade, except *define what*

something is and *state a wish*. The most frequent translation codes in seventh grade included *describe observable behavior* and *tell next event*.

Superior Spellers

In first grade superior spellers, twelve translation categories were observed and no presynaptic written language productions. The most frequently observed translation code was *tell the next event*. In third grade eighteen translation codes were observed. Of these, *describe observable behavior* and *tell next event* were most frequent. In fifth grade twenty two translation categories were observed. All had been observed in third grade except *give examples, state a wish, state if…then conditions, pretend or imagine*, and *pose question for reader*. Again the most frequent translation codes included *describe observable behavior* and *tell next event*. In seventh grade seventeen codes were observed of which the most frequent were *describe observable behavior* and *tell next event*. None emerged that had not been observed at an earlier grade. Again both Level I and Level II translation categories were used.

Table 2. Frequencies by Spelling Level and Grade - Expository Text
(Summarized across all Students in Each Spelling Ability Group within a Grade)

Poor Spellers	Gr 2 (n=10)	Gr 4 (n=19)	Gr 6 (n=10)
Level I Translation – Write the Next Sentence			
Presyntactic	0	1	0
State fact(s)	4	10	11
State an opinion/ belief	16	32	28
Describe - Paint picture with words	0	23	16
Describe state of mind/ feelings	0	1	0
Describe function or use	8	26	30
Describe observable behavior	0	0	0
Tell the next step or procedure	0	0	0
Tell next event	0	0	0
Tell prior event	0	0	0
Define what something is	4	6	12
Define what something is not	0	1	0
Illustrate - example/counter-example(s)	1	7	5
State a wish	0	0	0
State a goal/plan	0	0	0
Tell a plan for reaching the goal	0	0	0
Make a prediction	0	0	0
State conditions If…then (may be implied)	0	8	5
Pretend/ Imagine what could be	0	5	0
Make a comparison (analogy/metaphor)	0	5	0
State an outcome	0	0	0
Make a statement about time/ space	0	0	0
Provide an explanation	0	0	0
Qualify a prior statement	0	2	1
Evaluate content/organization of writing	0	0	0
Repeat part of prior text with substitution	0	0	0
Paraphrase prior text	0	0	0
Created direct dialogue among characters	0	0	0
Create indirect dialogue	0	0	0
Pose question for reader	0	0	0
Make editorial comment for reader	0	2	2
Issue direct/indirect command for reader	1	0	0

Table 2 continued. Frequencies by Spelling Level and Grade - Expository Text

	Gr 2	Gr 4	Gr 6
Level II Translation – Connect Sentences with the Emerging Discourse Structure in Mind			
Tie sentences with pronoun	11	24	26
Tie with a word in a subordinate clause	0	0	1
Connect sentences with a single word	0	9	4
Tie with a phrase that repeats/constructs prior proposition or content	0	1	1
Make a comment that interrupts idea in progress and continues with that idea	0	0	1
Expository Genre: Topic sentence for paragraph	0	0	1
Expository Genre: Provide information	0	0	2
Expository Genre: Compare and contrast	0	1	2
Expository Genre: Take position and defend (persuasive)	0	0	0
Expository Genre: Summarize	0	0	0
Expository Genre: Conclude	0	0	0
Expository Genre: State an ending	0	2	2
Overall Expository Translation			
Total Level I: Thinking about next sentence	34	127	110
Total Level IIA Within same level	11	34	33
Total Level II B Across levels	0	3	7
Total Sentences	32	113	101

Average Spellers	Gr 2 (n=9)	Gr 4 (n=18)	Gr 6 (n=10)
Level I Translation – Write the Next Sentence			
Presyntactic	0	0	0
State fact(s)	2	7	1
State an opinion/ belief	12	51	15
Describe - Paint picture with words	5	23	23
Describe state of mind/ feelings	0	5	5
Describe function or use	17	21	35
Describe observable behavior	0	1	0
Tell the next step or procedure	0	0	0
Tell next event	0	0	0
Tell prior event	0	0	0
Define what something is	4	13	12

Table 2 continued. Frequencies by Spelling Level and Grade - Expository Text

	Gr 2	Gr 4	Gr 6
Define what something is not	0	0	0
Illustrate - example/counter-example(s)	1	2	5
State a wish	0	0	1
State a goal/plan	0	1	0
Tell a plan for reaching the goal	0	0	0
Make a prediction	0	4	0
State conditions If…then (may be implied)	1	9	3
Pretend/ Imagine what could be	0	5	0
Make a comparison (analogy/metaphor)	0	11	4
State an outcome	0	0	0
Make a statement about time/ space	0	0	0
Provide an explanation	0	7	0
Qualify a prior statement	3	10	0
Evaluate content/organization of writing	0	0	0
Repeat part of prior text with substitution	0	0	0
Paraphrase prior text	0	0	0
Created direct dialogue among characters	0	1	0
Create indirect dialogue	0	0	0
Pose question for reader	0	0	0
Make editorial comment for reader	0	2	0
Issue direct/indirect command for reader	1	1	0
Level II Translation – Connect Sentences with the Emerging Discourse Structure in Mind			
Tie sentences with pronoun	6	36	9
Tie with a word in a subordinate clause	0	0	0
Connect sentences with a single word	1	2	1
Tie with a phrase that repeats/constructs prior proposition or content	0	6	1
Make a comment that intterrupts idea in progress and continues with that idea	0	10	5
Expository Genre: Topic sentence for paragraph	0	5	8
Expository Genre: Provide information	0	11	35
Expository Genre: Compare and contrast	0	5	0
Expository Genre: Take position and defend (persuasive)	0	0	0
Expository Genre: Summarize	0	0	0
Expository Genre: Conclude	0	1	0

Table 2 continued. Frequencies by Spelling Level and Grade - Expository Text

	Gr 2	Gr 4	Gr 6
Expository Genre: State an ending	0	7	3
Overall Expository Translation			
Total Level I: Thinking about next sentence	46	174	104
Total Level IIA Within same level	7	54	16
Total Level II B Across levels	0	29	46
Total Sentences	40	160	100

Superior Spellers	Gr 2 (n=10)	Gr 4 (n=19)	Gr 6 (n=10)
Level I Translation – Write the Next Sentence			
Presyntactic	0	0	0
State fact(s)	4	15	0
State an opinion/ belief	14	30	11
Describe - Paint picture with words	9	27	20
Describe state of mind/ feelings	0	0	1
Describe function or use	10	40	37
Describe observable behavior	0	0	0
Tell the next step or procedure	0	1	0
Tell next event	0	0	0
Tell prior event	0	0	0
Define what something is	9	21	11
Define what something is not	0	0	0
Illustrate - example/counter-example(s)	1	10	5
State a wish	0	0	0
State a goal/plan	0	0	0
Tell a plan for reaching the goal	0	0	0
Make a prediction	1	3	0
State conditions If…then (may be implied)	5	6	7
Pretend/ Imagine what could be	0	11	5
Make a comparison (analogy/metaphor)	3	7	3
State an outcome	0	0	0
Make a statement about time/ space	1	0	0
Provide an explanation	2	1	1
Qualify a prior statement	6	12	0
Evaluate content/organization of writing	0	0	0
Repeat part of prior text with substitution	0	0	0

Table 2 continued: Frequencies by Spelling Level and Grade - Expository Text

	Gr 2	Gr 4	Gr 6
Paraphrase prior text	0	0	0
Created direct dialogue among characters	0	0	0
Create indirect dialogue	0	0	0
Pose question for reader	0	1	0
Make editorial comment for reader	0	0	5
Issue direct/indirect command for reader	3	4	0
Level II Translation – Connect Sentences with the Emerging Discourse Structure in Mind			
Tie sentences with pronoun	19	38	24
Tie with a word in a subordinate clause	0	2	0
Connect sentences with a single word	6	15	6
Tie with a phrase that repeats/constructs prior proposition or content	2	7	8
Make a comment that interrupts idea in progress and continues with that idea	0	5	6
Expository Genre: Topic sentence for paragraph	1	5	8
Expository Genre: Provide information	2	21	27
Expository Genre: Compare and contrast	0	8	3
Expository Genre: Take position and defend (persuasive)	0	0	0
Expository Genre: Summarize	0	0	0
Expository Genre: Conclude	0	1	1
Expository Genre: State an ending	0	2	3
Overall Expository Translation			
Total Level I: Thinking about next sentence	68	189	106
Total Level IIA Within same level	27	67	44
Total Level II B Across levels	3	37	42
Total Sentences	57	170	101

Most Frequently Used Translation Categories for Expository (see Table 2)

The following summaries are based on all students in each spelling ability group within a grade level for a specific genre in Table 2. Collectively they provide a lens on which translation categories might be used by students in general at each of three spelling ability levels for expository writing.

Poor Spellers

In second grade, seven translation categories were observed in poor spellers. Most frequent was *state an opinion or belief*. In fourth grade seventeen translation categories were observed. Most frequent were *state an opinion or belief, describe observable behavior*, *describe by painting a picture in words*, and *describe function or use*. In sixth grade, fourteen translation categories were observed. Most frequent were *describe function or use, state an opinion or belief*, and *describe by painting a picture with words.* Most frequent Level I within level connections were use of pronouns across grade levels. Few Level II connections across sentences were used for expository genre.

Average Spellers

In second grade average spellers used six translation categories. Most frequent were *state opinion or belief* and *describe function or use*. In fourth grade eighteen were observed. In fourth grade, fourteen translation codes were observed with the most frequent being *state an opinion or belief, describe function or use*, and *describe by painting a picture in words*. In sixth grade nine translation categories were observed. Most frequent were *describe function or use, sate an opinion or belief,* and *describe by painting a picture with words*. As had been the case with poor spellers, the most frequent Level I within level connections were use of pronouns across grade levels. Few Level II connections across sentences were used for expository genre.

Superior Spellers

In second grade superior spellers used thirteen translation codes. Most frequent were *state an opinion or belief, describe a function or use*, and *describe by painting a picture with words*. In fourth grade they used fifteen translation categories. The same three were most frequent as had been in second grade. In sixth grade they used eleven translation codes and *describe observable behavior* and *describe state of mind or feelings* were most frequent. A variety of Level II strategies within and across sentences were observed.

Table 3. ANOVA Results for Cohort 1 - Narrative Text (N=30)

	F	*df*(time, error)	*p*	partial η^2
Main Effect of Grade				
Level I Thinking about the next sentence				
Describe observable behavior	14.940	2, 48	0.000	0.384
Tell next event	7.464	2, 48	0.004	0.237
Pretend/Imagine what could be	4.520	2, 48	0.038	0.158
State an outcome	4.676	2, 48	0.014	0.163
Provide an explanation	3.583	2, 48	0.035	0.130
Qualify a prior statement	4.621	2, 48	0.026	0.161
Level IIA Connecting sentences - Within same level				
Tie sentences with pronoun	7.120	2, 48	0.002	0.229
Connect with a single word	4.078	2, 48	0.042	0.145
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Character	5.149	2, 48	0.009	0.177
Setting	7.268	2, 48	0.002	0.232
Plot introduction	22.633	2, 48	0.000	0.485
Plot in progress	9.636	2, 48	0.000	0.286
Plot outcome	8.715	2, 48	0.000	0.266
Ending Statement	6.930	2, 48	0.002	0.224
Main Effect of Spelling				
Level I Thinking about the next sentence				
Tell next event	5.700	2,24	0.009	0.322
Make a statement about time/place	12.371	2,24	0.000	0.508
Qualify a prior statement	3.449	2,24	0.048	0.223
Create indirect dialogue	3.954	2,24	0.033	0.248
Level IIA Connecting sentences - Within same level				
Tie sentences with pronoun	4.412	2,24	0.023	0.269
Connect with a single word	7.826	2,24	0.002	0.395
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Character	4.019	2,24	0.031	0.251
Setting	6.190	2,24	0.007	0.340
Plot introduction	12.060	2,24	0.000	0.501
Plot in progress	9.515	2,24	0.001	0.442
Plot outcome	4.295	2,24	0.025	0.264
Interaction Grade x Spelling				
Describe - paint pictures with words	3.816	4,48	0.015	0.241

Table 4. ANOVA Results for Cohort 2 – Narrative Text (N=30)

	F	*df*(time, error)	*p*	partial η^2
Main Effect of Grade				
Level I Thinking about the next sentence				
Describe state of mind/ feelings	5.191	2,46	0.009	0.184
Describe observable behavior	7.131	2,46	0.002	0.237
Tell next event	3.317	2,46	0.045	0.126
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Setting	3.879	2,46	0.042	0.144
Plot introduction	9.797	2,46	0.000	0.299
Plot outcome	5.354	2,46	0.016	0.189
Main Effect of Spelling				
Level IIA Connecting sentences - Within same level				
Connect with a single word	3.773	2,23	0.038	0.247
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Character	4.637	2,23	0.020	0.287
Plot introduction	4.588	2,23	0.021	0.285
Interaction Grade x Spelling				
State an outcome	2.972	4,46	0.029	0.205
State an ending	2.865	4,46	0.034	0.199

Summary of ANOVA Results for Narrative Texts for Cohorts 1 and 2

Cohort 1 – Main effect of grade on Level I translation. Significant developmental changes across grade levels were observed at Level I (write the next sentence) on the following coded translation strategies on which main effects for grade were statistically significant (see Table 3 for ANOVA results and mean differences):

Describe observable behavior(s). Frequency of sentences describing observable behavior increased from first grade (M= 0.82, SD=0.48) to third grade (M=1.69, SD=0.76) to fifth grade (M=1.80, SD=1.06). Post hoc analysis with a Bonferroni adjustment revealed that use of this translation strategy significantly increased from first to third grade (p<.001), and from first grade to fifth grade (p<.001), but not from third to fifth grade (p=1.00).

Tell next event. Children's use of stating the next event increased from first grade (M=0.89, SD=1.71) to third grade (M=2.41, SD=2.38) and to fifth grade (M=3.43, SD=3.31). In particular, use from first to third grade (p=.004) and from first to fifth grade (p=.006) significantly increased, while the increase from third to fifth grade (p=.789) was not statistically significant.

Pretend or imagine what could be. Although an overall significant effect for grade level was detected (see Table 3), and an increase in zero use from first (M=.00, SD=.00) to third (M=0.03, SD=0.19) to fifth grade (M=0.27, SD=0.53) was observed, no significant pairwise comparisons were found: first to third grade (p=.99), third to fifth grade (p=.107), and first to fifth grade (p=.125).

State outcome. Children's use of this translational strategy increased across the grade levels, from first (M=0.11, SD=0.32) to third (M=0.28, SD=0.46) to fifth grade (M=0.47, SD=0.63). Significant changes were found only from first to fifth grade (p=.035), but not from first to third grade (p=.498) or from third to fifth grade (p=.253).

Explain. Children's use of explanatory statements increased from first (*M*=0.14, *SD*=.36) to third (*M*=0.48, *SD*=.74) to fifth grade (*M*=0.53, *SD*=.82). However, the increase was significant only from first to fifth grade (*p*=.026), but neither in third to fifth grade (*p*=1.000) nor first to third grade (*p*=.129).

Qualify prior statement. Increased use of qualifying statements was found from first (*M*=0.14, *SD*=.45) to third (*M*=0.52, *SD*=.83) to fifth grade (*M*=0.90, *SD*=1.13). Significant increase, however, was only detected from first to fifth grade writings (*p*=.003), but not from first to third grade (*p*=.143) nor from third to fifth grade (*p*=1.000).

Cohort 1 – Main effect of spelling on Level I translation. For the four main effects for transcription (spelling) ability (see Table 3), significant differences between groups were observed for the following translational strategies:

Tell next event. With better spelling skills, children in this cohort wrote more sentences within this translation category – poor (*M*= 3.80, *SD*=4.34), average (*M*=6.00, *SD*=3.94), and superior (*M*=10, *SD*=3.40) spelling. A significant difference was obtained between poor and superior spellers (*p*=.016); but not so between poor and average (*p*=.555) and average and superior spellers (*p*=.091).

State when and where. Children who were better spellers included more of this coded strategy in their writing than their less able peers – poor (*M*=0.19, *SD*=0.32) average (*M*=0.20, *SD*=0.42), superior spelling (*M*=2.00, *SD*=1.41) spelling. Differences between groups were significant between spellers considered poor and superior (*p*=.005) and average and superior (*p*=.009). No significant differences were found between poor and average spellers (*p*=.767).

Qualify prior statement. Frequency of codes for this translation strategy increased with spelling ability level – poor (*M*=0.50, *SD*=0.71), average (*M*=2.00, *SD*=1.15) and superior

(*M*=2.10, *SD*=1.85). A significant difference, however, was obtained only between poor and average spellers (*p*=.046), and not between poor and superior (*p*=.075) or average and superior (*p*=.990) spellers.

Indirect Dialogue. Superior spellers (*M*=1.70, *SD*=1.64) were more likely to apply indirect dialogue in their compositions than either average (*M*=0.60, *SD*=0.52) or poor (*M*=0.30, *SD*=0.67) spellers. Although a significant *F* test was obtained, no significant results were found after post hoc tests.

Cohort 1 – Interaction of grade and spelling on Level I translation. There was only one time by spelling ability interaction in cohort one for describe by painting a picture in words. However, post hoc tests revealed no significant effects for grade within any spelling level, regardless of a significant *F* test obtained at grade three (see Table 3). Post hoc tests for the simple effect of group also failed to detect any significant differences between spelling ability at any grade level.

Cohort 1 – Main effect of grade on Level II translation. Significant developmental changes across grade levels were observed at Level II (write the next sentence to create a higher-level unfolding discourse structure) on the following coded translation strategies for cohort one (see Table 3):

Using pronouns to tie sentences together. Use of pronouns to tie sentences increased from grade one (*M*=0.47, *SD*=0.75) to grade three (*M*=1.68, *SD*=2.17) to grade five (*M*=2.42, *SD*=2.31). This increase was significant for both grades one to three (*p*=.008) and grades one to five (*p*=.001), but not for grades three to five (*p*=.896).

Using single connecting word in independent clause or prepositional phrase to tie words together. Cohort one children applied this translation strategy with increasing frequency from

grade one (*M*=0.28, *SD*=0.72) to grade three (*M*=0.73, *SD*=1.16) to grade five (*M*=1.33, *SD*=1.82). This gain was found to be significant only between grades one to five (*p*=.043). However no significant differences were observed between grades one and three (*p*=.104) nor between three and five (*p*=.614).

Narrative genre-characters. Across grade levels, writers used more of this translational strategy as they progressed through the grades – from grade one (*M*=0.27, *SD*=0.53) to grade three, (*M*= 0.50, *SD*=0.75) to grade five (*M*=0.88, *SD*=0.90). The change was particularly significant for grades one to five, (*p*=.036), although not so for either grades one to three (*p*=.591) or grades three to five (*p*=.120).

Narrative genre-setting. From grade one (*M*=0.15, *SD*=0.36) to grade three (*M*=0.69, *SD*=0.72) to grade five (*M*=0.75, *SD*=0.80), increased use of statements about setting for framing the evolving discourse was significant. It was significant between grades one and three (*p*=.005) and grades one to five (*p*=.002). The change in use was not significant for grades three to five (*p*=1.00).

Narrative plot introduction. Children's use of plot introduction statements was observed to increase from grade one (*M*=0.18, *SD*=0.40) to three (*M*=0.68, SD=0.72) to five (*M*=1.28, SD=0.82). This increase was found to be significant between all grade levels – one to three (*p*=.002); one to five (*p*<0.001); and three to five (*p*=.011).

Narrative plot in progress. As children progressed through the grade levels, they wrote more statements about the unfolding plot – from grade one (*M*=0.58, *SD*=1.82) to three (*M*=2.81, *SD*=3.30) to five (*M*=3.95, *SD*=3.40). Frequency of use was significant from grades one to three (*p*=.006) and one to five (*p*=0.001), although not for grades three to five (*p*=.592).

Narrative plot outcome. Cohort one children's writing was found to include more of this translational strategy as they progressed from grade one (M= 0.09, SD=0.19) to three (M=0.20, SD=0.40) to five (M= 0.52, SD=0.64). The increased use was particularly significant between grades one to five (p=0.001). However, the change was not significant for either grades one to three (p=.309) or three to five (p=.082).

Narrative ending statement. From grades one (M=0.15, SD=0.36) to three (M=0.52, SD=0.70) to five (M=0.81, SD=0.83), children's writings evidenced more use of this strategy. However, this increase was significant only for grades one to five (p=.003), and not for grades one to three (p=.078) or grades three to five (p=.490).

Cohort 1 – Main effect of spelling on Level II translation. Significant results were observed for the main of effect of spelling ability on use of cohesive ties within the same level (sentence to sentence) and across levels (framing the composition within the genre structure):

Using pronouns to tie sentences together. Frequency of applying this coded translation strategy increased between poor (M=2.00, SD=2.36) and average (M=5.60, SD=2.55) spellers (p=.084), and decreased between average and superior (M=5.50, SD=3.87) spellers (p=.983). Only for poor and superior spellers, was the increased frequency of use by the better speller found to be significant (p=.022).

Using single connecting word in independent clause or prepositional phrase to tie words together. Frequency of this coded translation strategy rose with better spelling ability – poor (M=0.80, SD=1.32), average (M=1.70, SD=2.16), and superior (M= 4.10, SD=1.66). Although average spellers applied this translation strategy more than poor spellers (p=0.488) and superior spellers more than average spellers (p=.121), the only significant difference in use was between superior and poor spellers (p=.001).

Narrative genre – characters. Narratives of superior spellers (*M*=2.40, *SD*=1.78) evidenced more use of sentences introducing character than average (*M*=1.80, *SD*=1.03) or poor (*M*=0.70, *SD*=0.95) spellers. However, only between poor and average spellers (*p*=.050) was the difference significant, and not between poor and superior (*p*=.061) or average and superior (*p*=.528) spellers.

Narrative genre – setting. Writings of those with better spelling ability evidenced greater use of this genre level cohesive tie – poor (*M*=0.8, *SD*=1.14), average (*M*=1.30, *SD*=0.95), superior (*M*=2.50, *SD*=0.97). Post hoc results showed that the difference in use was significant between poor and superior spellers (*p*=.013), but not between poor and average (*p*=.612) or average and superior spellers (*p*=.057).

Narrative plot introduction. With better spelling ability, children wrote more sentences introducing plot – poor (*M*=0.90, *SD*=1.10), average (*M*= 1.90, *SD*=1.29), superior (*M*=3.30, *SD*=0.67). Those with superior spelling skills significantly applied this translation strategy more than the poorest skilled spellers (*p*<.001). On the other hand, the difference between those with poor versus average (*p*=.161) and average versus superior (*p*=.086) spelling abilities were not significant.

Narrative plot in progress. More skilled spellers in cohort one evidenced greater use of this genre level cohesive tie – poor (*M*=2.61, *SD*=4.77), average (*M*=7.10, *SD*=4.51), superior (*M*=11.50, *SD*=3.72). This difference in use was particularly significant between poor and superior spellers (*p*=.002), and not so between poor and average (*p*=.116) and between average and superior (*p*=.135) spellers.

Narrative plot outcome. The most skilled spellers (*M*=0.80, *SD*=0.79) applied this coded translation strategy with greater frequency than the average (*M*=1.20, *SD*=0.92) and least skilled

(*M*=0.20, *SD*=0.42) spellers. However, a significant difference between ability groups was found only between the poor and average spellers (*p*=.034). This significant difference was not observed for either poor and superior spellers (*p*=.149) or average and superior spellers (*p*=.134).

Cohort 2 – Main effect of grade on Level I translation. See Table 4. The same analyses for narratives at Levels 1 and 2 were performed on cohort two (overlapping in grades three and five) but also including grade seven in the overlapping cohort design. For these analyses, which are relevant to whether the effects for grade, spelling ability, and grade by spelling ability, results depend on whether the analyses began in grade three rather than grade one, the results were somewhat different for grade at Level I (write the next sentence) on the following coded translation strategies for cohort one:

Describe a state of mind or feelings. Across grade levels, sentences coded for this translation strategy increased in frequency – from grade three (*M*=0.23, *SD*=0.51) to five (*M*=0.73, *SD*=0.78) to seven (*M*=0.99. *SD*=1.06). This increase was significant only for grade three to seven (*p*=.010), and not for grades three to five (*p*=0.051) or five to seven (*p*=1.00).

Describe observable behavior. Writings for cohort two evidenced more use of this translation strategy as children progressed from grades three (*M*=1.44, *SD*=0.90) to five (*M*=2.49, *SD*=1.42), and then decreased slightly by grade seven (*M*= 2.32, *SD*=1.05). This decrease in use, however, was not significant (*p*=1.00). On the other hand, increased use was significant for children's writing between grades three to five (*p*=.006) and grades three to seven (*p*=.011).

Tell next event. Frequency of sentences coded for telling the next event rose from grade three (*M*=2.53, *SD*=2.49) to five (*M*= 3.95, *SD*=2.91) to seven (*M*=4.28, *SD*=3.29). Only for

grades three to seven was this rise significant (p=.050), but not for grades three to five (p=0.180) or five to seven (p=1.00).

Cohort 2 – Main effect for spelling and interaction with grade on Level I. For this cohort no main effects for spelling ability or grade by spelling ability for Level I (write the next sentence) were obtained.

Cohort 2 – Main effect for grade on Level II. The analyses for cohort 2 beginning at grade three, rather than grade one, grade effects were also different for Level II (write the next sentence to create a higher-level unfolding discourse structure).

Narrative setting. Writing samples reflected more instances of this translation code as children moved from third (M=0.50, SD=0.71) to fifth (M=0.98, SD=0.87) grades, but this increase was not observed in seventh grade (M=0.78, SD=0.71). Furthermore, no significant changes were detected in either third to fifth grades (p=.082), third to seventh grade (p=.450), or fifth to seventh grade (p=.277).

Narrative introducing plot. Genre cohesion using plot introduction increased from grades three (M=0.58, SD=0.50) to five (M=1.13, SD=0.82) to seven (M= 1.32, SD=0.71). This is rise in use was significant in both grades three to five (p=.016) and three to seven (p<0.001), although not for grades five to seven (p=.952).

Narrative plot outcome. Instances of this translational code rose from grades three (M=0.23, SD=0.43) to five (M=0.35, SD=0.56) to seven (M=0.73, SD=0.83). Significant change was observed only between grades three and seven (p=.010), but not between three and five (p=.864) or between five and seven (p=.213).

Cohort 2 – Main effect for spelling on Level II. Only three main effects for spelling on Level II coding for writing with the evolving discourse in mind were obtained (see Table 4).

Connecting single word in independent clause or preposition. Cohort two children's writings evidenced less use of this translation strategy with increased spelling ability – poor (M=5.50, SD=3.92), average (M=3.70, SD=2.00), and superior (M=1.70, SD=1.25). While decrease in use was significant between average and poor spellers (p=.043), the same significant result was not observed between poor and average (p=.712) or poor and superior (p=.060) spellers.

Narrative character. With better spelling ability, cohort two children included more of this coded translation strategy in their compositions – poor (M=0.70, SD=0.95), average (M=1.10, SD=0.88), and superior (M=2.20, SD=1.62) spelling. Post hoc tests failed to locate a significant difference between groups – poor and average spellers (p=.563), poor and superior spellers (p=.067), and average and superior spellers (p=.179).

Narrative introducing plot. Although application of this coded translation strategy increased with greater skill in spelling – poor (M=1.90, SD=1.45), average (M=3.00, SD=1.41), and superior (M=3.70, SD=1.16), the only significant difference was found between poor and superior spellers (p=.016). Differences between poor and average (p=.276) and average and superior spellers (p=.344) were not significant.

Table 5. ANOVA Results for Cohort 1 – Expository Text (N=30)

	F	*df*(time, error)	*p*	partial η^2
Main Effect of Grade				
Level I Thinking about the next sentence				
State a fact(s)	8.399	1,25	0.008	0.251
Illustrate - example/ counter-example	5.751	1,25	0.024	0.187
Pretend/Imagine what could be	5.171	1,25	0.032	0.171
Level IIA Connecting sentences - Within same level				
Repeat/construct prior proposition/content	4.420	1,25	0.046	0.150
Interrupt idea in progress	5.305	1,25	0.030	0.175
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Topic sentence for paragraph	6.735	1,25	0.016	0.212
Compare and contrast	5.918	1,25	0.022	0.191
Ending Statement	6.519	1,25	0.017	0.207
Interaction Grade x Spelling				
State an opinion or belief	3.803	2,25	0.036	0.233

Table 6. ANOVA Results for Cohort 2 – Expository Text (N=30)

	F	*df*(time, error)	*p*	partial η^2
Main Effect of Grade				
Level I Thinking about the next sentence				
Describe function or use	25.226	1,25	0.000	0.502
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Topic sentence for paragraph	9.461	1,25	0.005	0.275
Provide information	5.912	1,25	0.023	0.191
Ending statement	4.755	1,25	0.039	0.160
Main Effect of Spelling				
Level I Thinking about the next sentence				
State a fact(s)	4.777	2,25	0.018	0.276
Pretend/Imagine what could be	3.719	2,25	0.039	0.229
Make a comparison - analogy/metaphor	3.440	2,25	0.048	0.216
Level IIA Connecting sentences - Within same level				
Connect with a single word	3.652	2,25	0.041	0.226
Level IIB Connecting sentences - Across levels (Narrative Genre Organization)				
Topic sentence for paragraph	3.649	2,25	0.041	0.226
Provide information	3.476	2,25	0.047	0.218
Interaction Grade x Spelling				
Make editorial comment for reader	4.474	2,25	0.022	0.264

Summary of ANOVA Results for Expository Texts for Cohorts 1 and 2

Cohort 1 – Main effect of grade on Level I translation. Main effects for grade and significant differences were observed on the following coded translation strategies for writing the next sentence – from grade two (*M*=0.36, *SD*=0.49) to four (*M*=1.05 (*SD*=1.43) in *stating a fact* (*p*=.008); from grade (*M*= 0.11, *SD*=0.32) to four (*M*=0.51, *SD*=1.04) in *illustrating with examples and/or counter-examples* (*p*=.024); and from grade two (*M*=0.00, *SD*=0.00) to four (*M*=0.46, *SD*=1.04) in *pretending or imagining what could be* (*p*=.032).

Cohort 1 – Main effect for spelling on Level I translation. No main effects for spelling were obtained for Level I translational categories.

Cohort 1 – Interaction of grade and spelling on Level I translation. There was only one grade by spelling ability interaction for *state an opinion*. Post hoc analysis, however, failed to detect a significant difference between spelling groups on use of this coded translation strategy.

Cohort 1 – Main effect for grade on Level II translation. Grade was the only main effect observed for this translational level (write the next sentence to create a higher-level unfolding discourse structure). Significant main effects were obtained for the following categories: from grades two (*M*=0.04, *SD*=0.04) to four (*M*=0.44, *SD*=0.19) on *phrases that repeat prior content* (*p*=.046); and from grades two (*M*=0.00, SD=0.00) to four (*M*=0.30, *SD*=0.71) on *comments that interrupt idea in progress* (*p*=.030). A main effect for grade, along with significant grade level differences, were also observed for the following: between grades two (*M*=0.00, *SD*=0.00) to four (*M*=0.19 (*SD*=0.39) on *topic sentence for paragraph* (*p*=.016); between grades two (*M*=0.00, *SD*=0.00) to four (*M*=0.33 (SD=0.77) on *compare and contrast organization* (*p*=.022); and between grades two *M*=0.00 (SD=0.00) to four (*M*=0.33 (*SD*=0.67) for *ending statements* (*p*=.017).

Cohort 1 – Main effect of spelling and interactions with grade on Level II translation. No main effects for spelling ability or interactions with grade were obtained for this translational level.

Cohort 2 – Main effect of grade on Level I translation. There were significant grade effects for *describing a function*, with sixth graders (*M*=3.46; *SD*=2.03) applying more of this translation strategy than fourth graders (*M*=1.68; *SD*=1.72).

Cohort 2 – Main effect of spelling on Level I translation. Significant effects for spelling ability were found for only the following:

Statements of facts were more evident in the writings of poor spellers (*M*=1.40; *SD*=1.84) than average spellers (*M*=0.10, *SD*=0.32), which was more evident than superior spellers (*M*=0.00; *SD*=0.00).

Pretend or imagine statements were found more in the writings of superior spellers (*M*=1.20; *SD*=1.75) than average spellers (*M*=0.10; *SD*=0.32), who in turn applied the translation strategy more than poor spellers (*M*=0.00; *SD*=0.00).

Make a comparison (analogy or metaphor). In cohort two, children's expository essays employed more comparison statements with better spelling ability – poor (*M*=0.10; *SD*=0.32), average (*M*=1.30; *SD*=1.57), and superior (*M*= 0.70; *SD*=0.95).

Cohort 2 – Interaction of grade and spelling on Level I translation. There was one grade by spelling interaction for *makes editorial comments for audience*. However, no significant differences were found between spelling groups at grade four or grade six. Only superior spellers showed significant gains between grades four and six.

Cohort 2 – Main effect of grade on within Level II translation. Significant differences were found between grade levels for use of *topic sentence* – increased use between

grades four (*M*=0.17; SD=0.39) and six (*M*=0.60; *SD*=0.79); for *providing information* – increased between grades four (*M*=0.72; *SD*=1.88), grade 4, *M*=2.27 (*SD*=3.39), grade 6; and for *ending statement* – decreased between grades four (*M*=0.74; *SD*=0.38) and six (*M*=0.29; *SD*=0.46).

Cohort 2 – Main effect of spelling on within Level II translation. With better spelling ability, children's writings evidenced more codes for *connecting words in clauses and phrases* – poor spelling (*M*= 1.10; *S*D=1.10), average (*M*=0.10; *SD*=0.32), and superior (*M*=1.40; *SD*=1.51); for use of *topic sentence* – poor spelling (*M*=0.10; *SD*=0.32), average (*M*=1.00; *SD*=1.15), and superior (*M*=1.10; *SD*=0.99); for *providing information* – poor spelling (*M*=0.20; *SD*=0.63), average (*M*=4.00; SD=4.97), and superior (*M*=4.30; *SD*=4.35).

Relationship of Transcription Ability to Levels I, IIA, and IIB Translation Categories

To address the second research aim, a final set of analyses was conducted for Study 1. For each cohort, the overall frequency of Level I write the next sentence, Level IIA cohesions within and across sentences, and Level IIB evolving genre-specific text categories was compared across grade levels in which genre was kept constant. For these analyses, mixed ANOVA was used with repeated measures on two within subject variables--grade (three levels for narrative or two levels for expository) and translation strategies (3 levels), and one between subject variable – spelling ability (3 levels).

Cohort 1. For this cohort (grades one, three, and five for narrative), there were significant main effects for grade, $F(2,23)=43.18$, $p<.001$, levels $F(2,23\ )=51.29$, $p<.001$, and spelling, $F(2,24)=12.92$, $p<.001$. Use of all translation codes improved over time. Overall Level I (next sentence) translation codes were used more often than either kind of Level II translation categories. In general good spellers outperformed average spellers who outperformed poor

spellers. There were no significant interactions. Also for this cohort (grades two and four for essay) there were two significant main effects and two significant interactions: grade $F(1,25)=41.40$, $p<.001$, translation strategies, $F(1,25)=100.50$, $p<.001$, translation strategies by grade, $F(1,25)$, 17.37, $p<.001$, and grade by spelling, $F(1,25)=4.39$, $p=.023$. Overall, use of each translation code for essay writing increased from second to fourth grade, but in second grade no Level IIB translation codes (genre-specific) were used. In fourth grade Level IIB translation categories were used. In second grade, the superior spellers outperformed either the poor or average spellers, but in fourth grade, the superior spellers outperformed the average spellers who outperformed the poor spellers at both Level I (next sentence) and Level II (evolving text).

Cohort 2. For this cohort (grades three, five, and seven for narratives), there were main effects for grade, $F(2,46)=4.36$, $p=.015$, translation category, $F(2,46)=118.90$, $p<.001$, a significant interaction for translation code by spelling ability, $F(4,46)$ 10.39, $p<.001$ and a significant interaction of grade by level, $F(4,92)=3.88$, $p=.006$. The interaction of level and grade indicated that use of Level I and Level IIB (genre-specific) translation codes increased more than Level IIA (within level cohesion). The interaction with spelling ability indicated that those with greater spelling ability increased their use of level II translation categories more than those with lower spelling ability. For this cohort (grades four and six for essays), there were main effects for grade, $F(1,25)=7.89$, $p=.01$ and translation category $(2,25)=107.85$, $p<.001$, a significant interaction between grade and level of translation category, $F(2,50)=3.99$, $p=.025$. Across these grades, use of all the translation categories increased, in general Level I translation codes were used more often than Level II, but the relative use of Level IIB compared to Level IIA increased.

CHAPTER 4: STUDY 1 DISCUSSION

Conceptual Significance

Kinds of Cognitive-Linguistic Translation Categories

A variety of both Level I and Level II translation categories were observed in both narrative and expository compositions (see Tables 1 and 2), many of which were only used by some of the students and some of the time. This pattern of results is consistent with not only language processes but also cognitive and cognitive-linguistic translation processes being generative. There are many ways for translating and individuals may vary from moment to moment and over development in translation categories used. Thus, the first hypothesis was confirmed that a coding scheme for translation of cognitions into written language could be developed for both Level I (next sentence) and Level II translation (evolving discourse) codes but there would be considerable variability among individuals in using the possibilities because translation is fundamentally generative just as language is.

Which Translation Categories Show Developmental Change?

In answering this question, it is important to keep in mind that translation categories are not the same as number of sentences written. Although for cohort one, the total number of sentences increased from grades one to three to five, the number of sentences is not exactly the same as the number of translation categories employed. That is because one next sentence sometimes reflected both a Level I and Level II or multiple Level I or even multiple Level II translation codes.

Nevertheless, for some of the more frequently used translation categories, significant main effects for increased use of a translation category across development occurred. However, the specific ones that were observed to increase in frequency depended on the starting grade

level and genre (first for narrative and second for expository in cohort one or third for narrative and fourth for expository in cohort two) and the genre.

For example, for cohort one, significant developmental change toward increased usage was observed for the following Level I translation codes from grades one to grade five, but as posthoc pairwise comparisons showed the change was significant from grades one (early childhood) to grade five (middle childhood) rather than to or from third grade: *describe observable behaviors, tell next event, pretend or imagine what could be, state outcome, explain, and qualify prior statement*. For cohort two, significant developmental change toward increased usage was observed for the following Level I translation categories from grades three to seven: *describe a state of mind or feelings, describe observable behavior*, and *tell next event*. Again the change was reliably significant from third grade (early childhood) to seventh grade (transition from middle childhood to early adolescence). Note that only two of these Level I translation categories showed significant developmental changes in both cohorts, whether from grades one to five or grades three to seven for narrative.

For cohort one, the following Level I translation codes showed significant developmental change in expository writing from grades two to four: *stating a fact, illustrating with examples and/or counter examples*, and *pretending or imaging what could be*. For cohort two, the following Level I translation category showed significant developmental change in expository writing from grades four to six for describing a function. None of the cohort one and cohort two categories that showed developmental change overlapped across the cohorts.

Thus, although a few frequently used Level I translation codes overall showed developmental change, which ones depended on the grade levels assessed and stage of

development (e.g. early childhood or middle childhood) and genre of writing (narrative or expository).

Developmental changes in Level II translation categories were also examined for each genre and cohort. In cohort one, main effects for increased use over grade levels one (early childhood) to five (middle childhood) were observed for eight Level II: two at Level IIA—*use of pronouns to tie sentences together* and *use of single connecting words*—and six at Level IIB related to narrative genre-*characters, -setting, -plot introduction, -plot in progress, -plot outcome,* and -*ending statement*. In cohort two, main effects were observed for increased use over grade levels three (early childhood) to seven (transition middle childhood to early adolescence) for three Level IIB translation codes in narrative—*setting, introducing the plot,* and *plot outcomes*—but Level IIB translation strategies did not show developmental change. For expository, in cohort one, significant developmental changes occurred from second to fourth grade in two Level IIA translation codes—*repetition of prior comments* and *comments that interrupt*—and three genre-specific Level IIB translation codes—*use of a topic sentence for a paragraph*, and genre-specific categories for *compare and contrast* and *making an ending statement*. In cohort two, significant developmental change from grades four to six in Level IIB in expository writing occurred in the increased use of *topic sentence* and *providing information* but the decreased use of *ending statements* but not in Level IIA categories. Thus, as was the case with narratives, there was variability across cohorts for expository writing and whether Level IIA or IIB translation codes were considered.

How are Transcription and Translation Related?

Transcription (spelling ability) is not the same as translation (transforming thoughts into written language), but transcription may interfere expository with or support translation and

more so at certain grade levels or depend on whether Level I or Level II translation strategies or genre are involved. Both main effects of transcription (spelling ability) and interactions of transcription with spelling ability and level of translation category were of interest. When Level I (next sentence) and Level II (evolving discourse) were compared without differentiating the Level IIA categories related to cohesion and coherence and Level IIB genre-specific categories, results in cohort one for narrative yielded four main effects for transcription ability in which superior spellers used the translation category more than average spellers who used them more than poor spellers: *state the next event, state when and where, qualify prior statement*, and *indirect dialogue*. Only one interaction between grade and transcription ability was observed for a Level I translation code for narrative in which only average and superior spellers in the first three grades used the *paint a picture with words* translation code. For cohort two, Level I translation codes for expository, main effects for grade occurred for illustr*ate with an example or counter-example*. There was only one grade by transcription ability interaction for state an opinion in expository in which at grade two poor spellers outperformed average spellers but not at grade four when average spellers outperformed superior spellers. In cohort one, main effects for Level II strategies for creating cohesion related to genre, and total sentences produced were observed as well as a main effect for transcription ability and interaction between grade and transcription ability for expository translation strategy.

However, main effects for transcription were observed for the following Level II translation strategies in cohort two for narrative: *connecting single words, narrative-characters, narrative—introducing the plot*. The only grade by transcription ability interaction occurred for Level II translation codes for creating cohesion, but sometimes average spellers applied that category more or produced more sentences than superior spellers, showing that transcription

ability is separable from translation codes. Main effects for grade in total number of sentences produced and main effects transcription ability and Level II expository genre coherence were observed in expository genre coherence.

However, because of the central importance of main effects and interactions with transcription ability for the second research aim to tease apart the constraints of spelling ability on translation categories and the first set of analyses was based only on the most frequently used translation codes which a small subset of all that were observed and coded, a final analysis examined the effect of spelling ability when the dependent measure was total frequency of each of the three kinds of translation coded—Level I, Level IIA, and Level IIB—for each student. For cohort one narrative, the main effect for spelling was significant. In general good spellers outperformed average spellers who outperformed poor spellers. There were no significant interactions of grade or specific translation strategy with spelling. Also for this cohort (grades two and four for essay) there was only one significant interaction of spelling with grade. In second grade, the superior spellers outperformed both the poor and average spellers, but in fourth grade, the superior spellers outperformed the average spellers who outperformed the poor spellers. Thus, for typically developing writers in first through fifth grade, spelling ability was shown to have an effect on translation in general across the three kinds of strategies rather than specific to one of them. Only in cohort two for narratives was the interaction between spelling ability and translation strategies significant; for expository, there was no main effect for spelling ability or interaction of spelling ability with translation strategy or grade. Thus, spelling ability may constrain application of diverse translation strategies in general in grades one to five for both genre and grades three to seven for narrative but not expository—at least for typically developing writers. That led to the research questions motivating Study 2—which translation

categories will be evident in the writings of students in grades four to nine with persisting problems in transcription (handwriting and/or spelling) and what might this finding signify for their writing instruction?

CHAPTER 5: STUDY 2 COMPUTERIZED WRITING LESSONS

Rationale and Research Aim

The goal of Study 2 was to extend what had been learned from assessment research about development of translation categories and the potential constraints of transcription (spelling ability) on it in typically developing writers to intervention research designed for students with specific learning disabilities (SLDs) in which handwriting and/or spelling may impair their learning to write. The **Specific Aim of Study** 2 was to evaluate whether or not bringing use of the translation strategies, which had been observed with some frequency in typically developing writers, to the attention of students with SLDs would result in their using some of these translation strategies in their (a) self-generated personal, autobiographical essays, (b) written summaries based on read source material (integrated reading-writing), or (c) written summaries based on heard source material (integrated listening-writing). Autobiographical writing was chosen because developing writers often find this genre easier—to translate thoughts about their personal lives into written language. Writing summaries about read or heard source material was chosen because it has ecological validity for the kinds of school assignments developing writers with or without SLDs are expected to do at school.

Although considerable research over the past three decades has focused on self-regulated writing strategies, most of it has focused on genre-level writing, for example, for narratives and persuasive essays (for review, see Graham & Perrin, 2007a, 2007b, 2007c; Harris, Graham, MacArthur, Reid, & Mason, 2011; MacArthur, Graham, & Fitzgerald, 2006; Troia, 2009). Because many struggling writers, especially those with SLDs, which impair transcription skills like handwriting (dysgraphia) and spelling (dyslexia) and listening, reading, and writing at the syntax level as well as transcription skills (oral and written language disability, OWL LD) , tend

to write less than age peers, focusing their attention on possible translation strategies might facilitate their composing by providing clues for creating the very next sentence. The tested hypothesis was that the translation strategies, which were taught prior to the writing task or tasks at the end of each culminating composing activity and made available through a link students could click on while composing, would be observed in the compositions.

Participants

Students in grades 4 to 9 were assigned to groups based on evidence-based comprehensive assessment administered prior to the computerized lessons (Berninger & Richards, 2010; Silliman & Berninger, 2011): dyslexia, which is impaired word-level spelling, dysgraphia, which is impaired subword handwriting, and oral and written language learning disability (OWL LD), which is impaired syntax comprehension and construction. Altogether 33 of the participants in the first cohort to complete the 18 computerized writing lessons were analyzed for the current research. Their ages and grades ranged from 10 years in grade five to 14 years in grade nine when they began the intervention. The 28 males (four in grade five; 19 in grade six, four in grade eight, and one in grade nine) and five females (two in grade six, two in grade seven, and one in grade 9) comprised an ethnically diverse group. Parents identified their children as Asian-American (2.9%), Pacific Islander (2.9%), White (79.4%) and the rest as mixed ancestry – White-Middle Eastern (2.9%), White-African American (2.9%), White-Asian (2.9%), and White-Hispanic (5.9%). In terms of mother's educational attainment, 2.9% obtained a high school degree, 44.1% a college degree, and 52.9% more than a college degree.

Computerized Instruction on Translation Strategy

The first two lesson sets focused on handwriting and spelling/word reading and the last three on text comprehension and composing. Appendix 2 contains the translation strategies

covered in Learning Activity 6 of the computerized lessons on comprehension and composing before the students engaged in written composing. All had been observed in Study 1 and were taught as strategies for writing the next sentence. Appendix 2 also contains the coding scheme used to code the observed strategies in the students' composing.

At the beginning of the writing lessons, the 'computer teacher' (an audio instructor built into each lesson) presented the translation strategies in a list and encouraged children to click on them one by review and think about them before to moving on to the composing activity or activities for the lesson. During that composing, students were instructed to click on a link at the bottom of the screen to review what strategies they could use while they composed. That is, they could refer back to them and review as needed. Each screen page – a blank notepad – included a link back to the strategies. These could be accessed at any time in the writing process.

Anecdotal observations from research assistants, including this dissertation author, who served as an intervention teacher, noted that children would sometimes pause in their writings and refer back to the list of translation strategies. Although no systematic procedure was implemented for documenting exact moments when individual students accessed the strategies page, the behavior was noted in a journal maintained by the teachers and discussed in meetings.

Writing Tasks

For the first six lessons, in each lesson students wrote on a different topic designed to generate autobiographical writing. For the next twelve lessons they completed both a reading-writing and a listening-writing task in each lesson. For each of the two writing activities integrated with another language system, they first read or listened to source material equated for number of words and of comparable content on the same topic related to a subject area of school

curriculum (e.g., math or world geography). Then they took notes and finally they wrote summaries about what they read or heard. All source materials were expository.

Coding Units

The operational definition for a coding unit remained the same for Study 2 as in Study 1. A coding unit was defined on the basis of level I or level II translation strategies. Because the lessons were computerized, all composing was done using either stylus for three lessons in a row or keyboard for three lessons in a row on an iPad. All students had prior experience using laptops but the nature of the iPad monitor constrains the amount of written text produced that can be displayed on the screen at any one time. A server linked to the ID for each student writer saved all the written compositions for future analyses.

One word ending statements such as *Done, The end*, or *Finished* were not coded because they served only as markers to indicate when children ended their summary. Although students were given a total of 15 minutes to compose before the computer lesson ended the session, students often took less time to complete their summaries. In keeping with the goal of building children's writing stamina, they were encouraged to keep writing until time ran out. The ending statements served as markers to delineate where the summary ended and the irrelevant free-writing began.

Interrater Reliability

A coding scheme derived from Study 1 was used to code observed translation strategies in each of the three kinds of writing: (a) self-generated personal essay. (b) summarization after reading source material and taking notes, and (c) summarization after listening to lecture and taking notes. The coding scheme was evaluated for interrater reliability on a sample of all 30

writing samples. Interrater agreement across all 30 writing samples (six in first six lessons and twenty-four in the last twelve lessons—two per session) was 87%.

Approach to data analyses

As relevant to the specific aim of the Study 2, a two-prong approach to data analyses was adopted. First, the frequency of the occurrence of the various coded translation strategies across the lessons was tallied for each of the students and then for the whole group that was first to complete the computerized lessons. These are not separated by diagnostic groups based on different kinds of specific learning disabilities because in a related study evaluating pretest-posttest changes on normed measures diagnostic group did not predict response to instruction (under review). The computerized lessons contained many instructional components related to the various impaired writing, reading, and oral language skills and not just related to translation strategies.

Of note, frequencies were computed only for the lessons in which the student produced written text. For some lessons, the students did not write but rather drew or scribbled or engaged in off task behaviors. Because the first specific aim of Study 2 was to evaluate which of the translation strategies taught in the next to last learning activity were used by the students overall, productions that were not writing were not coded but were noted for the second specific aim of Study 2 to describe the individual student profile. Sometimes errors occurred in storing what they wrote which was then not accessible to researchers for analysis. The frequencies were summarized across students by nature of writing task: autobiographical writing (Lessons 1 to 6), integrated reading-writing (Lessons 7 to 18), and integrated listening-writing (Lessons 7 to 18). For the writing that required reading or listening to source material and then summarizing it,

additional coding translation strategies were constructed to deal with what was observed in the written summaries that was not taught as translation strategies.

Second, an individual learner profile was constructed to capture an overview of the translation strategies used by each of the individual students. Of interest was whether the student might use all or most of the taught translation strategies at least once across lessons for different kinds of writing tasks. Such individual profiles are relevant to teaching practice in which teachers are expected to adapt or modify instruction for individual students' instructional needs in writing.

CHAPTER 6: STUDY 2 RESULTS

Descriptive Analyses of Codes by Type of Writing

Table 7 summarizes frequency of occurrence of the various coded translation strategies for autobiographical writing, Table 8 for Integrated Reading-Writing, and Table 9 for Listening-Writing. The purpose of examining frequencies is to evaluate whether there is evidence that the students used the taught translation strategies in each of the three kinds of writing activities they completed.

Autobiographical Writing

As shown in Table 7, all but two of the taught translation strategies—IA7 (*tell the next step in the procedure*) and IA 10 (*tell what something is not*)—were used by one or more students in autobiographical writing (first six lessons). Inspection of the table shows which translation strategies were used most often overall, which were used with moderate frequency, and which were used only occasionally by some students. Nevertheless, all but two taught translation strategies were used by some students some of the time in some of their autobiographical writing. Those two strategies are not relevant to autobiographical writing and might have shown up in writing to explain how to perform an activity or procedure or explaining how to differentiate one thing or concept from another one. Overall, the most frequent Level I translation strategies in autobiographical writing at Level I in rank order of overall occurrence were as follows IA6 (*describe observable behavior*), IA4 (*describe a state of mind or feeling*), IA2 (*state an opinion*), IB (*provide an explanation*), IA1 (*state a fact or facts*), IA3 (*describe by painting a picture with words*), and IC1 (*qualify a prior statement*). However, Level II translation strategies for connecting the next sentence to the evolving discourse were also used. Of these, the most frequent was IIA1 (*tying together with a connecting word and connecting*

sentence). The students also showed evidence of using multiple translation strategies (e.g. Level I and Level II) in the next sentence. See Table 7.

Table 7. Frequency of Each Translation Strategy Observed in Autobiographical Writing – Lessons 1-6

Level I Write the Next Sentence		
IA1	State fact(s)	139
IA2	State an opinion/ belief	215
IA3	Describe - Paint picture with words	123
IA4	Describe state of mind/ feelings	233
IA5	Describe function or use	2
IA6	Describe observable behavior	335
IA7	Tell the next step or procedure	0
IA8	Tell next event	95
IA9	Define what something is	10
IA10	Define what something is not	0
IA11	Illustrate - example/counter-example(s)	96
IA12	State a wish	65
IA13	State a goal/plan	17
IA14	Tell a plan for reaching the goal	1
IA15	Make a prediction	21
IA16	State conditions If…then (may be implied)	17
IA17	Pretend/ Imagine what could be	57
IB	Provide an explanation	197
IC1	Qualify a prior statement	110
IC2	Evaluate content/organization of writing	18
IC3	Repeat part of prior text with substitution	31
IC4	Paraphrase prior text	10
ID1	Created dialogue among characters	23
ID2	Pose question for reader	9
ID3	Make editorial comment for reader	73
ID4	Issue direct/indirect command for reader	3
Level IIA Connecting sentences - Within same level		
IIA1	Tie sentences with word and/or sentence	573
IIA2	Make a comment that intterrupts idea in progress and continue with that idea	50
Level IIB Connecting sentences - Across levels (Autobiographical Essay Genre Organization)		
IIB1	State a topic sentence for sentences that follow	88
IIB2	Summarize main ideas or points so far	4
IIB3	Draw conclusion	1
IIB4	State outcome of a sequence	1
IIB5	Compare - how same and/or how different	11
IIB6	Make an ending statement for text	15
Overall Translation		
Total Level I		1909
Total Level IIA		623
Total Level IIB		120
Total Combining Levels		743

Integrated Reading-Writing

As shown in Table 8, all the Level I translation strategies except *state a goal or plan* or *make a plan to reach a goal* were used by some of the students some of the time. The most frequently used Level I translation strategies in rank order were *state fact or facts, state an opinion or belief, make an editorial comment to the audience, illustrate with examples or counter examples, provide an explanation*, and *qualify a prior statement*. Overall, more Level I than Level II translation strategies were used, and sometimes both Level I and Level II strategies were used. Sometimes the main idea was stated accurately. The number of accurate details far surpassed inaccurate ones. Sometimes irrelevant statements were included.

Integrated Listening-Writing

As shown in Table 9, all the Level I translation strategies except *define what something is not, tell a plan for reaching a goal*, and *dialogue among characters*, were used at least once by some writer. The most frequently used Level I translation strategies in rank order were *state fact or facts, illustrate with examples or counter-examples, state an opinion, make an editorial comment to the audience, provide an explanation*, and *qualify a prior statement*. Thus, the same translation strategies were used for integrated listening-writing as for integrated reading-writing, but the rank order was slightly but not substantially different. As with integrated reading-writing, for integrated listening-writing, more Level I than Level II translation strategies were used, and sometimes both Level I and Level II strategies were used; sometimes the main idea was stated accurately, the number of accurate details exceeded the inaccurate ones, and sometimes irrelevant statements were included.

Table 8. Frequency of Each Translation Strategy Observed in Written Summaries about Read Source – Lessons 7-18

IA1	State fact(s)				761
IA2	State an opinion/ belief				93
IA3	Describe - Paint picture with words				17
IA4	Describe state of mind/ feelings				10
IA5	Describe function or use				16
IA6	Describe observable behavior				16
IA7	Tell the next step or procedure				0
IA8	Tell next event				22
IA9	Define what something is				13
IA10	Define what something is not				0
IA11	Illustrate - example/counter-example(s)				91
IA12	State a wish				4
IA13	State a goal/plan				0
IA14	Tell a plan for reaching the goal				0
IA15	Make a prediction				3
IA16	State conditions If…then (may be implied)				7
IA17	Pretend/ Imagine what could be				2
IB	Provide an explanation				36
IC1	Qualify a prior statement				31
IC2	Evaluate content/organization of writing				16
IC3	Repeat part of prior text with substitution				6
IC4	Paraphrase prior text				4
ID1	Created dialogue among characters				2
ID2	Pose question for reader				18
ID3	Make editorial comment for reader				86
ID4	Issue direct/indirect command for reader				2
IIA1	Tie sentences with word and/or sentence				303
IIA2	Make a comment that interrupts idea in progress and continue with that idea				21
IIB1	State a topic sentence for sentences that follow				55
IIB2	Summarize main ideas or points so far				1
IIB3	Draw conclusion				4
IIB4	State outcome of a sequence				5
IIB5	Compare - how same and/or how different				4
IIB6	Make an ending statement for text				17
Total Level I					1462
Total Level IIA					324
Total Level IIB					86
Total Combining Levels					410
Additional Codes For Summary Writing					
Was a main idea stated accurately?		Yes 67	No 48	None stated	141
How many accurate details from source?					892
How many inaccurate details from source?					206
How many irrelevant information?					239

Table 9. Frequency of Each Translation Strategy Observed in Written Summaries about Heard Source – Lessons 7-18

IA1	State fact(s)	578
IA2	State an opinion/ belief	79
IA3	Describe - Paint picture with words	18
IA4	Describe state of mind/ feelings	15
IA5	Describe function or use	30
IA6	Describe observable behavior	15
IA7	Tell the next step or procedure	2
IA8	Tell next event	7
IA9	Define what something is	10
IA10	Define what something is not	0
IA11	Illustrate - example/counter-example(s)	91
IA12	State a wish	2
IA13	State a goal/plan	0
IA14	Tell a plan for reaching the goal	0
IA15	Make a prediction	1
IA16	State conditions If…then (may be implied)	4
IA17	Pretend/ Imagine what could be	1
IB	Provide an explanation	35
IC1	Qualify a prior statement	34
IC2	Evaluate content/organization of writing	8
IC3	Repeat part of prior text with substitution	10
IC4	Paraphrase prior text	5
ID1	Created dialogue among characters	0
ID2	Pose question for reader	14
ID3	Make editorial comment for reader	59
ID4	Issue direct/indirect command for reader	3
IIA1	Tie sentences with word and/or sentence	230
IIA2	Make comment that interrupts idea in progress & continue with that idea	20
IIB1	State a topic sentence for sentences that follow	58
IIB2	Summarize main ideas or points so far	2
IIB3	Draw conclusion	3
IIB4	State outcome of a sequence	0
IIB5	Compare - how same and/or how different	2
IIB6	Make an ending statement for text	16
Total Level I		1150
Total Level IIA		250
Total Level IIB		81
Total Combining Levels		331
Additional Codes For Summary Writing		
Was a main idea stated accurately?	Yes 97 No 28 None stated	99
How many accurate details from source?		675
How many inaccurate details from source?		129
How many irrelevant information (e.g. from personal or background knowledge)?		240

Findings Based on Group Analyses

Children used significantly more Level II within the same level cohesion when writing autobiographical essays (M=0.49, SD=0.18) than when writing Read and Write summaries (M=0.24, SD=0.18), $t(32)=6.780$, $p<.001$ or in their Listen and Write summaries (M=0.25, SD=0.18), $t(31)=5.713$, $p<.001$). However, use of Level II within same level cohesion was not significantly different between writing summaries for Read and Write (M=0.24, SD=0.18) and Listen and Write (M=0.25, SD=0.18), $t(31)=0.233$, $p=.818$.

Compared to Read and Write summaries (M=0.06, SD=0.07), children's percent use of Level II across levels (genre) cohesion was significantly greater for autobiographical essays (M=0.10, SD=0.08), $t(32)=2.197$, $p=.035$. In contrast, no significant difference was detected between children's application of Level II across levels (genre) cohesion in autobiographical (M=0.10, SD=0.08) and Listen and Write (M=0.07, SD=0.08) writings, $t(31)=1.899$, $p=.067$. Again, no significant difference was detected in use of Level II across levels (genre) cohesion for Read and Write (M=0.06, SD=0.07) and Listen and Write (M=0.07, SD=0.08) summaries, $t(31)=-0.675$, $p=.505$.

The lack of significant differences between Read and Write and Listen and Write suggests that mode of text prompt presentation may matter little to whether or not these children can write text with the evolving discourse structure in mind - a skill requiring higher level executive functions for coordinating multiple processes. It did not seem to aid or hinder use of Level II cohesion for summaries based on heard or read sources.

Individual Student Profiles of Translation Strategies.

Below are the individual observations of children's writing within each genre lesson set. While number of sentences is indicated for stylus and for keyboard, kinds of translation strategies are reported across modes.

While children's use of the taught translational strategies are inferred from the frequency of their occurrence across multiple samples of summary writings, the codes analyzed for main idea and summary content might provide a window into whether the use of these strategies contributed to the accuracy – and indirectly to quality – of the summaries. The total for irrelevant details combines statements based on irrelevant background knowledge, personal remarks, editorial comments, and other off-topic information. Combined, these details could offer a more complete picture of the child's writing profile, relevant for instructional purposes.

Student 1 (male, grade 5). For autobiographical writing, no writing samples were collected for keyboard, and only two for stylus (total 17 sentences). Translation strategies for writing the next sentence included IA2 (once), IA4 (four times), IA6 (eight times), IA8 (once), IA11 (five times), ID3 (once), and ID3 (once). Translation strategies for connecting sentences were mostly IIA1 and occasionally IIA2—9 times versus once, respectively. At the genre-level, only one translation strategy for making an ending statement (IIB6) was made.

For the Read and Write Summary samples, although one keyboard sample was missing, the child still produced more sentences by this mode (38) than by stylus (30). At Level I, the child's writing employed more IA1 (33) translation strategies, but also included IA2 (6), IA3 (1), IA9 (1), IA11 (7), IA17 (1), IB (8), IC1 (3), and ID2 (1). On the other hand, Level II cohesive ties were IIA1 (11), IIA2 (1), and IIB1 (3). In three summaries, the child copied the sentence organization of the text prompt. In one summary, he stated an accurate main idea; for four

summaries stated inaccurate main ideas; and stated no main ideas for the rest. Of the total sentences, 50 were factual text-based details, 8 inaccurate text-based statements, and 10 irrelevant statements.

For the Listen and Write Summary, no texts were produced for four tasks (two by stylus, two by keyboard), and one stylus sample was excluded, as the child wrote a running commentary rather than a summary. The child wrote a total of 22 sentences by keyboard and 14 by stylus. At Level I, he employed IA1 (most frequently, 17), IA2 (3), IA3 (1), IA4 (1), IA9 (1), IA11 (4), IA16 (1), IB (3), IC1 (1), IC3 (1), and ID3 (1); and at Level II, IIA1 (8), IIB1 (1), and IIB5 (1). Only one summary stated an accurate main idea, while none were made in any other samples. The child extracted twenty-seven factual statements from the text, but wrote five inaccurate text-based sentences and four irrelevant statements.

The child used more Level I translation strategies for Read and Write versus Listen and Write. Across all samples, Level I IA1 and Level I IIA1 were used most frequently. The content of the combined summaries were also comprised of mostly inaccurate and irrelevant details.

Student 2 (male, grade 6). For the autobiographical tasks, this child wrote more sentences for stylus (10 sentences) compared to keyboard (4 sentences). However, this may not be surprising, as only one keyboard sample was collected versus three for stylus. Translation strategies for writing the next sentence included IA2 (twice), IA3 (once), IA4 (five times), IA6 (four times), IA8 (once), and IA13 (once). This child employed IIA1 (seven times) to connect sentences and IIB1 (once) to make a genre-specific connection.

Only two of the child's Read and Write summaries by stylus, and none by keyboard, were coded. For the excluded samples, the child copied directly from the text prompt. Of the 11 sentences included in the analyses, four were verbatim copies and one was a copy with minor

change(s) in word choice. These sentences showed evidence for use of IA1 (7), IA11 (1), ID2 (1), and ID3 (2) at Level I; and IIA1 (2) and IIB1 (1) at Level II. In one sample, the child wrote an accurate main idea, seven text-based details, and four irrelevant statements.

For the Listen and Write Summary tasks, the child only wrote one summary by stylus (one sentence) and two summaries by keyboard (eight sentences). He applied translational strategies at Level I with IA1 (4), IA11 (1), and ID3 (2) and at Level II with only IIA1 (2). He wrote an accurate main idea for three of the four samples, and none for the remaining. The child also included five details from the prompt and wrote two inaccurate text-based details and two irrelevant statements.

Too few samples were collected across Read and Write and Listen and Write to warrant a comparison. Interesting to note is that the child copied the text for almost all lessons when given the prompt to read. For the missing Listen and Write texts, he simply did not write a summary.

Student 3 (male, grade 6). This child wrote more sentences in keyboard (28), compared to stylus (16) for the autobiographical writing tasks. Child had no missing samples. For sentence to sentence translation, child employed IA2 (19 times), IA3 (once), IA4 (six times), IA6 (eight times), IA11 (once), IA13 (once), IB (11 times), ICI (five times), IC2 (twice), IC3 (once), ID2 (once), and ID3 (five times). At a higher level, the child connected sentences using IIA1 (20 times) and employed genre-specific discourse structure with IIB1 (four times), IIB5 (once), and IIB6 (once).

Read and Write summaries were collected only for keyboard (19 sentences) because all stylus writings were illegible. For Level I translation strategies, the child applied IA1 (13), IA2 (3), IA4 (1), IA6 (1), IA8 (6), and IA11 (2). He employed IIA1 (8), IIB1 (5), and IIB4 (1) for Level II cohesion. Although the child wrote a main idea for each summary, only two of the six

were accurate. Less than half of total sentences were text-based factual details (8). The rest comprised one inaccurate text-based statement and 10 irrelevant statements.

Because of illegible handwriting, the summaries by stylus were also excluded from analysis of this child's Listen and Write summaries. For the 25 sentences written by keyboard, he utilized IA1 (most frequently, 16), IA2 (2), IA6 (1), IA8 (2), IC1 (1), IC3 (1), and ID3 (1) for Level I, and IIA1 (7), IIA2 (1), IIB1 (2), IIB5 (1), and IIB6 (1) for Level II cohesion. He wrote a main idea for all summaries, but only two were accurate. This child also included 16 accurate details from the text, but produced five inaccurate details and four irrelevant statements.

The child wrote more text for Listen and Write (25) than for Read and Write (19). He also utilized more translation strategies across levels in writing summaries when the prompt was heard versus read. Furthermore, proportionally less inaccurate and irrelevant statements were written, compared to text-based factual details, during Listen and Write. Fact-based statements for Read and Write were outnumbered by the total inaccurate and irrelevant statements.

Student 4 (female, grade 9). In her autobiographical writing, this child wrote 31 sentences across stylus writing samples. No keyboard texts were available. Translation strategies for writing the next sentence included IA1 (three times), IA2 (10 times), IA3 (once), IA4 (12 times), IA6 (once), IA16 (once), IB (six times), ICI (seven times), and ID3 (twice). Translation strategies for connecting sentences were mostly IIA1 (9 times), while discourse-level translation strategies were IIB1 (twice) and IIB6 (once).

The child produced more sentences by stylus (41) than by keyboard (33) for Read and Write summaries. She utilized Level I translation strategies for writing the next sentence with IA1 (most frequently, 23), IA2 (1), IA3 (1), IA5 (1), IA11 (2), and IB (1); and Level II cohesive ties with IIA 1 (8), IIA2 (1), IIB1 (2), and IIB6 (1). As a whole, she copied one sentence

verbatim from the prompt and three with slight word change(s). In addition, sentences in six of ten summaries were written in the same order as the sources. On the other hand, half of the summaries included an accurate main idea, while the other half did not state one. The child's 34 factual details from the text outnumbered six inaccurate details and one irrelevant statement.

Seven sentences by keyboard were collected from two summaries and 28 sentences by stylus from five summaries during the Listen and Write tasks. She did not produce summaries for four lessons, and one keyboard sample was excluded for containing only sentence fragments. At Level I, the most frequent was IA1 (25), while others were IA2 (5), IA4 (1), IA5 (2), IA6 (1), IA9 (2), IB (1), and IC3 (1). At Level II, most cohesive ties were IIA1 (14), and others were IIA2 (1) and IIB1 (1). The child produced an accurate main idea for four summaries, an inaccurate main idea for one, and no main idea for two. Furthermore, she included more accurate details (26) from the sources than either inaccurate details (2) or irrelevant statements (7).

This child wrote more sentences for Read and Write (74) compared to Listen and Write (35). Overall, she applied more Level I translational strategies when the prompt was heard than read. Across all samples, factual details outnumber irrelevant or inaccurate details. However, more inaccurate details were noted for Read and Write. This presentation mode also produced more copied sentences and more instances of copied sentence organization.

Student 5 (male, grade 6). Although one less keyboard text was collected from this child's autobiographical writings, he wrote a total of more sentences for keyboard (18), compared to stylus (16). Sentence to sentence translation strategies employed were IA2 (once), IA3 (four times), IA (five times), IA6 (four times), IA8 (six times), IA15 (seven times), IB (twice), IC1 (six times) , and ID1 (three times). Most high level translation strategies were

indicated for connecting sentences – IIA1 (most frequently, 11 times) and IIA2 (twice), with only four instances of genre-specific discourse structure – IIB1.

Five Read and Write summaries by keyboard (total 9 sentences) and four by stylus (total 5 sentences) were written by this child. He did not write a summary for the missing data. The most frequent Level I translation strategy used was IA1 (12), with only one count each for IA5 and ID2. The only Level II translation strategy applied was IIA2 (1). All fourteen sentences were text-based factual details. Across the 12 summaries, one sentence was copied verbatim from the text prompt and three with slight word change(s). Three summaries included a main idea, although inaccurately stated. No main idea was stated for the others.

For Listen and Write, the child wrote nine sentences by keyboard and 13 by stylus over 12 summaries. He produced no text for one stylus and two keyboard lessons. Translation strategies he employed for Level I were IA1 (most frequently, 13), IA2 (2), IA3 (1), IA5 (2), IA6 (2), and IC1 (1); and for Level II were IIA1 (6) and IIA2 (1). The child wrote a main idea for two summaries, but only one was accurately stated. Summary content included 14 text-based details, three inaccuracies, and five irrelevant details.

More sentences were written in Listen and Write (22) than in Read and Write (14). The child also applied twice as many translation strategies across Levels 1 and 2 when the text sources were heard versus read. Across all samples, the number of factual details was the same. However, only in Listen and Write did the child write inaccurate and irrelevant details.

Student 6 (male, grade 5). For autobiographical writings, this child wrote a total of 22 sentences with the stylus and 26 with keyboard – although one less keyboard writing sample was collected. Translation strategies for writing the next sentence included IA1 (six times), IA2 (five times), IA3 (three times), IA4 (seven times), IA6 (six times), IA8 (twice), IA11 (11 times), IA12

(three times), IA15 (once), IA16 (four time), IB (six times), and IC2 (once). Child used connecting words and sentences 19 times (IIA1), and genre level structure 4 times for IIB1 and once for IIB6.

Across 12 Read and Write summary samples, the child wrote more sentences by keyboard (29) versus by stylus (19). The most frequent Level I translation strategy used was IA1 (36). Employed with less frequency were IA3 (2), IA5 (1), IA6 (1), IA9 (1), IA11 (5), IB (1), and ID2 (1). For Level II, only genre-specific translation strategies were applied – IIB1 (2) and IIB6 (1). One sentence from the entire set reflected a word-for-word copy of the prompt. Across summaries, five presented an accurate main idea, while two presented inaccurate main ideas, and the rest included none. More sentences detailed facts from the prompt (25), compared to two inaccurate understanding of the text and one irrelevant statement.

For Listen and Write, the child composed more sentences by keyboard (26) than by stylus (23). He applied a wide range of translation strategies – IA1 (most frequently, 27), IA3 (3), IA6 (4), IA7 (1), IA9 (1), IA11 (4), IB (1), IC1 (1), IC2 (1), ID2 (1), and ID3 (1) at Level I; and IIA1 (most frequently, 7), IIB1 (4), and IIB6 (3) at Level II. Across summaries, he wrote an accurate main idea for seven of eight samples. A majority of his 37 sentences were accurate details from the text, and six were inaccurate details and six were irrelevant remarks.

The child wrote almost the same number of sentences across Listen and Write (49) and Read and Write (48). However, he applied more Level I translation strategies for Listen and Write. Across both modes of presentation, most summaries included main ideas – many of which were stated accurately. Content of his writings contained more accurate facts, but for Listen and Write, he wrote proportionally more inaccurate and irrelevant statements compared to accurate fact-based sentences.

Student 7 (male, grade 6). This child wrote more total sentences with a keyboard (53) than a stylus (28) for the autobiographical writing tasks. The most translation strategies employed for writing the next sentence were IA4, IA6 and IA8 (coded 21 times for each translation strategy). With less frequency were IA1 (once), IA2 (three times), IA3 (three times), IA12 (seven times), IA13 (once), and ID3 (once).

The child did not employ any genre-level organizing strategies. However, strategies were employed for connecting words and sentences (IIA1) twelve times and interrupting idea in progress (IIA2) eight times. Writing was a litany of the child's experiences moving to the United States, interspersed with change of subject that was carried over several sentences (/ indicates sentence break; // indicates change in subject): when I was at my country my school thre was not then I was sweting/ that I went to US that I never swet for 4 yoers // when I was at my school that I did not remember that I was thin that you can see my bone// when I think about that I remmer my dog Piolo/ that hi died/ that I still miss him whe I sleep/

Only two Read and Write summaries, both by keyboard (12 sentences), were collected for analysis. Those excluded comprised off-topic writing, a running commentary on the subject, and writing too illegible to read. The child employed IA1 (6) with the most frequency, along with a few other Level I translation strategies – IA3 (1), IA15 (1), IA16 (1) and ID2 (1). He did not make any Level II connections. Two of the total sentences were directly copied from the prompt and one copied with slight word change(s). The sentences in one summary were written according to the structure of the text prompt. Main ideas were not stated. Six sentences reflected accurate information from the text, while two reflected inaccurate understanding and four presented irrelevant information.

Only one of the child's keyboard samples (4 sentences) was included in the Listen and Write analysis. He employed a limited number of translation strategies – IA1 (2), IA4 (1), and ID2 (1). Content included two factual and two irrelevant statements. He did not write any main ideas.

Not enough samples were collected to warrant a comparison between the two modes of prompt presentation. Interesting to note, however, was the child's tendency to write running commentaries about the subject, rather than to follow directions and write a summary.

Student 8 (male, grade 6). For total autobiographical sentences, this child wrote 50 with a keyboard and 31 with a stylus. However, one less writing sample was available for the stylus. A wide variety of sentence to sentence translation strategies were employed – IA1 (twice), IA2 (11 times), IA4 (10 times), IA6 (eight times), IA8 (nine times), IA11 (twice), IA12 (twice), IA17 (11 times), IB (twice), IC1 (11 times), IC2 (once), IC3 (four time), IC4 (once), ID1 (six times), ID2 (twice), and ID3 (nine times). Although the child wrote over 80 sentences, less than half of total sentences were coded for evidence of use of evolving discourse structures. Most sentence ties were for IIA1 (32 times), with only one observed for IIA2. Only one genre-specific translation strategy, IIB1 (3 times), was coded.

Because of missing data, illegible handwriting, and off-topic writing, five Read and Write summaries (2 by keyboard, 3 by stylus) were excluded from the analysis. The child produced 18 sentences for each mode. He employed IA1 (13) at Level I most frequently, with the remaining classified as IA2 (7), IA4 (1), IA11 (5), IC2 (1), and ID3 (4). He used IIA1 (9) with the most frequency for connecting sentences at Level II. Others included genre-level IIB1 (1), IIB5 (1), and IIB6 (1). Of the total sentences one reflected a word-for-word copy of the prompt, 19 provided factual text-based information, five misstated information from the text, and 12 made

irrelevant remarks. Across summaries, three included an accurate main idea, one presented an inaccurate main idea, and three did not include one.

Only half of Listen and Write were included in the analysis. Excluded were one off topic and two subject-related commentaries by keyboard, as well as two illegible stylus texts. No writing recorded for one stylus lesson. Level I translation strategies employed for the 14 keyboard sentences and 19 stylus sentences included IA1 (9), IA2 (2), IA5 (3), IA9 (1), IA11 (9), IB (1), IC1 (2), ID2 (1), and ID3 (1). Only IIA1 (8) was applied for Level II. Across summaries, the child stated three accurate and two inaccurate main ideas. Content consisted of more factual details (24) than either inaccurate statements (4) or irrelevant remarks (5).

The child produced almost the same number of sentences in Read and Write (36) and Listen and Write (33). He did, however, use more Level I translation strategies for Listen and Write, but more Level II translation strategies for Read and Write. For summaries written from reading the prompt, the child made almost as many irrelevant and inaccurate statements as accurate ones. This was less the case for Listen and Write summaries.

Student 9 (male, grade 6). Although one less autobiographical essay by keyboard was collected, this child had greater total sentences for keyboard (31) than stylus (29). Although a variety of translation strategies for writing the next sentence were employed, most involved IA1 (14 times), IA6 (19 times), and IA11 (10 times). Fact statements to write about his life included such examples as "my math teacher is Ms. Hummel…For period three I have Ex core or band depending on what day it is." With less frequency at this level were IA2 (twice), IA3 (three times), IA4 (five times), IA8 (once), IA9 (once), IA12 (three times), IB (five times), IC1 (four times), and ID3 (once). This child used cohesive ties for IIA1 (12 times) and IIA2 (6 times). Genre-level cohesion was made using IIB1 (three times) and IIB2 (twice).

Although the Read and Write samples were short by one missing summary by keyboard, the child wrote almost as many sentences by keyboard (31) as by stylus (36). The child's sentences at Level I translation strategies were mostly IA1 (43) and the others were IA2 (1), IA5 (3), IA9 (2), IA11 (9), IC1 (3), and ID3 (1). Cohesive ties at Level II employed mostly IIA1 (13) and genre-specific IIB1 (2), IIB5 (2), and IIB6 (2). Total sentences included one verbatim copy, 57 statements of text-based information, five inaccurate understandings of the text, and five irrelevant statements. As a whole, one summary included an accurate main idea, one stated an inaccurate main idea, and the rest did not include a main idea.

For Listen and Write, no text was produced for two keyboard lessons. Across the summaries, however, 17 sentences were written by keyboard and 35 by stylus. The range of Level I translation strategies included IA1 (most frequently, 20), IA2 (6), IA3 (2), IA4 (3), IA5 (5), IA11 (6), IB (1), IC1 (2), and IC4 (2). On the other hand, Level II translation strategies applied IIA1 (most frequently, 11), IIA2 (3), IIB1 (2), and IIB6 (1). Across the samples, the child wrote an accurate main idea for two summaries. Although 17 factual details were written, the rest of the sentences were inaccurate details (6) or irrelevant statements (29). Note that some statements of facts, coded IA1, were not relevant to the body of the summary.

This child produced more sentences for Read and Write (67) than for Listen and Write (52). However, he applied a greater number of Level I translation strategies to his sentence when writing summaries from heard sources. Looking at the content of his summaries, this use of translation strategies did not reflect summaries with more relevant details. More of the child's writings were irrelevant and inaccurate statements for Listen and Write than for Listen and Write. For the Read and Write summaries, factual text-based details greatly outnumbered

inaccurate and irrelevant statements. Note that only once did the child copy a sentence and copy the sentence organization of the prompt when required to read source material.

Student 10 (male, grade 5). For autobiographical writing, the child wrote more sentences by stylus (28) than keyboard (10). However, one keyboard sample was not available. Stating facts about his life (IA1) comprised the largest number of sentence to sentence statements (14 times). Use of other Level I translation strategies included IA3 (once), IA4 (four times), IA6 (seven times), IA9 (once), IA13 (three times), IB (twice), IC1 (eight times), and IC3 (once). Discourse level cohesion was observed 12 times for IIA1 and once for IIA2, with two genre-specific ties for IIB1 and one for IIB6.

With a complete sampling of Read and Write summaries, this child wrote more sentences by keyboard (39) than by stylus (3). He applied mostly IA1 (41) and IA11 (14), with a wide range of other Level I translation strategies IA6 (1), IA8 (1), IA12 (1), IA15 (1), IB (1), IC1 (4), IC4 (1), and ID3 (2). At Level II, he most frequently used IIA1 (20), along with IIA2 (1), IIB1 (8), IIB4 (1), and IIB6 (2). For four samples, he structured the order of his sentences according to the order of sentences in the text prompt. He wrote an accurate main idea for five, while he misstated the main idea in one and included none in the others. Most of his sentences conveyed factual details from the text (65). A few were inaccurate text-based information (2) or irrelevant statements (2).

Although the sample for Read and Write was short two summaries by keyboard (child wrote no text for the lessons), the number of sentences he wrote for keyboard (20) almost equaled the number of sentences by stylus (23). Level I translation strategies applied were IA1 (most frequently, 26), IA2 (2), IA11 (7), IB (1), IC1 (2), IC2 (1), IC3 (1), IC4 (1), and ID3 (1). For Level II, he used IIA1 (18), IIB1 (3), IIB2 (1), and IIB6 (2). No sentences were copied

directly from the prompt, although one summary presented information in the same order as the prompt. He wrote an accurate main idea for five summaries, none in the rest. Total summary content consisted mostly of text-based details (37), in addition to inaccurate statements (4) and irrelevant details (2). Note that across both Read and Write and Listen and Write summaries, the majority of his statements presented information that was relevant to the summaries. However, he wrote more when presented with information in written form (Read and Write).

Student 11 (female, grade 7). No keyboard texts were recorded for this child's autobiographical writing. She wrote 34 sentences by stylus, employing a range of sentence to sentence translation strategies– IA1 (once), IA2 (six times), IA4 (11 times), IA6 (four times), IA11 (3 times), IA12 (four times), IA14 (once), IB (five times), IC1 (twice), and ID3 (twice). Use of discourse level translational strategies was recorded for IIA1 (8 times), IIA2 (twice), and IIB1 (once).

With a complete sample of Read and Write summaries, Student 11 wrote more sentences by keyboard (50) compared to stylus (44). The majority of her sentences involved IA1 (46) translation strategies at Level I, although the rest of her sentences fell under a wide range of translation strategies – IA2 (3), IA6 (1), IA8 (2), IA9 (1), IA11 (5), IA16 (1), ID1 (1), and ID3 (2). The most frequent Level II cohesive tie was IIA1 (14), followed by two occurrences of IIB6. Her statements were based heavily on the written sources. Of her total sentences, two were copied verbatim, nine written with one or two word changes, and five with a change in syntax. Sentences in 10 of 12 summaries were written exactly in the same order as the prompt. However, she only presented three accurate main ideas. Two were stated inaccurately and none were written in other samples. As for content, 55 sentences detailed facts lifted directly from the

text prompt, while 35 stated information inaccurately and 4 conveyed irrelevant background or personal remarks.

Nine summaries were analyzed for Read and Write. The child produced no text for two keyboard lessons and one completely illegible text for a stylus lesson. Total sentences included 15 written by keyboard and 25 written by stylus. Most sentences were coded as IA1 (22), but also included IA2 (1), IA11 (1), IB (1), IC1 (2), and ID3 (1). At Level II, IIA1 (11) was used most frequently, followed by IIB1 (2). Although the child did not copy sentences directly from the prompt, for three summaries, she copied the organization of information in the sources. Three summaries included an accurate main idea. Summary content consisted of 23 text-based facts, 16 inaccurate statements, and 5 irrelevant details.

Across Read and Write and Listen and Write samples, although more than half his statements were based on text-based details, the remaining were largely statements that illustrated his misunderstanding of information from the sources. Whether read or heard, this child's showed poor comprehension of the material.

Student 12 (male, grade 7). For the autobiographical tasks, this child wrote almost twice the amount of sentences for stylus (26) than keyboard (14). A variety of Level I translation strategies was used to write the next sentence – IA1 (three times), IA2 (seven times), IA3 (three times), IA4 (four times), IA6 (seven times), IA8 (twice), IA11 (five times), IA12 (three times), IA13 (twice), IA15 (once), IB (once), and IC1 (three times). At a higher level, within sentence connections were made using mostly IIA1 (11 times) and once for IIA2. The genre-Level IIB1 cohesive tie was used four times.

With two summaries by stylus and two by keyboard missing from the data, the child wrote more sentences by keyboard (25) compared to stylus (15) for the Read and Write tasks.

Only four Level I translation strategies were employed – IA1 (most frequently, 25), IA5 (5), IA11 (5), and IC1 (1). Level II translation strategies applied to these sentences included IIA1 (5) and genre-specific IIB1 (3) and IIB6 (1). Sentences in five of eight summaries presented information in the same order as written in the text source. Two sentences were copied verbatim, six with slight word change(s), and two with a minor change in syntax. Only two summaries included an accurate main idea, one presented an inaccurate main idea, and five did not include one. Most of the sentences detailed factual information from the text (36), while only four reflected misunderstanding of information.

For Listen and Write, the samples were available for short two stylus- and two keyboard-texts. The 13 sentences by keyboard and 18 by stylus mostly employed IA1 (14) at Level I, but also included IA2 (1), IA5 (4), IA6 (1), IA9 (1), IA11 (5), IB (1), and IC1 (1). Application of cohesive ties included IIA1 (most frequently, 7) and IIB1 (4). Only one of the total sentences was a verbatim copy of a sentence in the source. For the four summaries where the child wrote a main idea, all were stated accurately. The content of the summaries consisted of 20 text-based facts, six inaccurately stated details, and five irrelevant statements.

Across both Read and Write and Listen and Write samples, the child wrote more when the source was read (40) than heard (31). He also included more relevant fact details compared to both inaccurate and irrelevant details (0 in Read and Write). Note that across all samples, this observation parallels his application more translation strategy IA1 than others.

Student 13 (male, grade 5). Only one sample of autobiographical writing by keyboard was collected from this child, with eight sentences produced by this mode. On the other hand, 35 total sentences were collected from the complete sample of stylus writings. Translation strategies employed for writing the next sentence included IA1 (five times), IA2, (seven times),

IA3 (once), IA4 (three times), IA6 (11 times), IA8 (twice), IA11 (twice), IA12 (once), IA16 (once), and IC1 (three times). The only higher-level cohesive tie applied was IIA1 (14 times).

Only three Read and Write summaries, with seven sentences by keyboard and two by stylus, were included in this analysis. For the keyboard, child did not write for two lessons and wrote off-topic for the other two. For the stylus, he did not provide summaries for two lessons, wrote off-topic for one, and wrote illegibly for the other. Only four Level I translation strategies were employed – IA1 (5), IA3 (1), IA11 (1), and ID2 (1); and none for Level II. One of the total sentences was copied verbatim, four with slight word changes. One of three summaries was organized according to the order of information presented in the source. Finally, seven sentences provided accurate information, while two posed inaccuracies.

For the Listen and Write tasks, the child produced no text for two stylus and two keyboard lessons. Three other stylus texts were excluded for illegible writing, off topic writing, and mere note-writing. The four samples (three by keyboard and one by stylus) collected for analysis consisted of 11 sentences were written by keyboard and 10 by stylus. Translation strategies applied to these sentences included IA1 (most frequently, 11), IA2 (2), IA5 (1), IB (2), IC3 (1), IC4 (1), and ID2 (1) at Level I and only IIA1 (1) at Level II. For the one summary wherein the child presented information in the same order as the prompt, he included one verbatim copy of a sourcesentence. He wrote only one main idea which was stated accurately. Most of his sentences were text-based details, along with two inaccurate statements and two irrelevant remarks.

Across Read and Write and Listen and Write samples, this child's summaries constituted more relevant fact statements than inaccurate or irrelevant information. This seems consistent with the more frequent application of Level I translation strategies. In addition, he used a Level

II cohesive tie only once. Not enough samples were collected to make conclusions about which mode of source presentation (read or heard) corresponded with more writing.

Student 14 (male, grade 7). For autobiographical writing, this child wrote more by keyboard (33) versus stylus (11). Types of sentences written about his life were mostly IA3 (10 times) and IA6 (11 times). Others included IA1 (five times), IA2 (five times), IA4 (twice), IA11 (four times), IB (six times), IC1 (three times), and IC3 (three times). The greatest number of cohesive ties applied was for IIA1 (22 times). However, use of genre-level cohesion included IIB1 (three times) and IIB5 (four times).

This child's Read and Write by stylus were short two samples (one missing and one off topic). Total sentences totaled 20 for keyboard and 13 for stylus. He employed IA1 (most frequently (14), IA2 (2), IA6 (2), IA8 (1), IC1 (4), and ID3 (2) at Level I, and only IIA1 (9) at Level II. For five summaries, he wrote inaccurate main ideas; none in the rest. He included 19 factual details, eight inaccurate statements (IA2), and six irrelevant remarks.

The Listen and Write sample was short three stylus texts because the child produced no writing for one lesson, wrote a running commentary for another, and experienced audio problems for the last. For the two missing keyboard texts, he produced no writing for one lesson and off topic writing for the other. A total 13 sentences by keyboard and nine by stylus were written for the collected summaries. For these, the child applied IA1 (most frequently, 15), IA2 (1), IA3 (2), IA4 (1), IA6 (1), and ID3 (2) at Level I and no cohesive ties at Level II. He wrote an accurate main idea for three summaries. Most sentences were text-based facts (18), with on inaccurate statement, and one irrelevant detail.

Overall, the child composed more sentences in the Read and Write lessons than in Listen and Write. His writings also evidenced use of cohesive ties only for the Read and Write

summaries. However, although IA1 was the most frequently applied translation strategies across both modes of text presentation, he made less inaccurate and irrelevant statements in the Listen and Write summaries.

Student 15 (female, grade 7). Although short of one sample for autobiographical writing by keyboard, this child wrote more sentences by keyboard (20) than stylus (12). The child applied a range of Level I translation strategies for writing the next sentence – IA1 (twice), IA2 (six times), IA4 (three times), IA6 (once), IA15 (once), IA16 (once), IA17 (ten times), IB (six times), IC1 (four times), and ID 3 (twice). The only cohesive ties applied were IIA1 (four times) and IIB1 (once).

Only two summaries by keyboard and two by stylus were available for this analysis. The child produced no writing for three stylus lessons and wrote an irrelevant narrative for one. Keyboard lessons were excluded because she simply copied the source for two lessons, wrote off topic for one, and wrote a running commentary about the prompt subject in the other lesson. For the nine sentences by keyboard and seven by stylus, she employed IA1 (most frequently, 7), IA2 (1), IB (1), and ID3 (6) for Level I and only IIA2 (4) for Level II. Her sentences did not state an accurate main idea. In addition, three were copied directly from the source, four with slight word change(s), and one with a change in syntax. Seven sentences detailed facts from the text, one presented inaccurate information, and eight conveyed irrelevant remarks. Across summaries, one followed the sentence organization of the prompt.

During the Listen and Write tasks, the child experienced audio problems and could not hear the prompt for three lessons (one by keyboard, two by stylus). For one keyboard lesson, she wrote a running commentary on the subject. She also produced off topic writing for one stylus lesson. For the rest, she produced no writing. Only 11 sentences from two summaries by

keyboard and one sentence from one summary by stylus were collected for analysis. Unlike her peers who applied more IA1, this child applied ID3 (6) most frequently. Of significance was her dislike of math, the topic of some sources, and her resistance to the intervention. Thus, possibly not surprising, were editorial comments such as: i didnt much agree that what math is, is counting i think math is more about... actualy yay math is about counting and makeing small childeren who have hard times with numbers suffer because they can't keep foces!

Other translation strategies applied were IA2 (1), IA16 (1), IC2 (1) and ID3 (6) at Level I; and IIA1 (3), IIA2 (1), and IIB6 (1) at Level II. These sentences comprised the six factual details and six irrelevant statements of the total summaries. Only half of her statements were relevant to the task. Furthermore, one of two written main ideas was stated accurately.

Across both Read and Write and Listen and Write, this child completed only a quarter of the writing tasks. For both modes of prompt presentation, her summaries presented an equal amount of relevant and irrelevant information. In addition, she applied IA1 less (Listen and Write) or as much (Read and Write) as other translation strategies.

Student 16 (male, grade 6). With one missing keyboard sample for autobiographical texts, this child still wrote a total more sentences for keyboard (39) than for stylus (26). The majority of statements made, for writing the next sentence, applied IA2 (17 times). A wide range of other translation strategies used also included IA1 (once), IA3 (three times), IA4 (eight times), IA6 (11 times), IA11 (once), IA12 (five times), IA15 (seven times), IA17 (seven times), IC1 (three times), IC4 (once), and ID3 (three times). The greatest number of cohesive ties employed was IIA1 (30 times). Only IIB6 (twice) for genre-level cohesion was applied.

With one keyboard writing excluded as a running commentary, the total Read and Write sample included 43 sentences by keyboard and 42 by stylus. The child employed Level I IIA1

(29) with the greatest frequency, along with a variety of other translation strategies – IA2 (15), IA3 (4), IA4 (1), IA11 (2), IA12 (2), IB (2), IC1 (1), IC4 (1), ID2 (1), and ID3 (13). Most Level II cohesive ties were IIA1 (31), with limited occurrence of IIA2 (3) and IB1 (1). The child produced an accurate main idea for two summaries, an inaccurate main idea for two, and none for seven. Factual details (30) were out-numbered by inaccurate details (15) and irrelevant statements (40).

This child wrote 6 sentences for one keyboard lesson and 25 sentences for four stylus lessons in Listen and Write. He did not produce a text for one stylus and four keyboard lessons. One keyboard writing was excluded as an irrelevant running commentary on the subject. Translation strategies applied were IA1 (most frequently, 17), IA2 (8), IA11 (2) IA12 (2), and ID2 (1) at Level I; and IIA1 (most frequently, 16), IIA2 (1), and IIB1 (1) at Level II. In terms of content, these sentences comprised 20 text-based details, one inaccurate detail, and 10 irrelevant statements. For five summaries, he wrote a main idea, but only three were accurate.

In general, more summaries were collected for Read and Write than Listen and Write. In writing the next sentence, the child applied IA1 the most; and in using cohesive ties, he applied IIA1 most frequently. For Listen and Write, the child's relevant text-based statements outnumbered inaccurate and irrelevant information. In contrast, Read and Write summaries contained more irrelevant statements, alone and in combination with inaccurate details, than relevant text-based details. Note that he interspersed a large number of Level I translation strategies, 15 IA2 (state opinion/belief) and 13 ID3 (make editorial comment), throughout his writings. Combined, these remarks outnumber IA1 (fact statements). If the child was applying these translation strategies, then he may benefit from teaching that helps him know if a particular

strategy should be included, whether or not it will enhance the quality of his writing, when to use that strategy, and how it should be applied.

Student 17 (male, grade 7). Twelve sentences for keyboard and eight for stylus were coded across four samples of autobiographical writing (one not available for each mode). The child wrote sentences that were coded for IA1 (once), IA2 (twice), IA3 (twice), IA4 (five times), IA6 (five times), IA8 (twice), IA11 (once), IA12 (once), IA13 (once), IA16 (twice), IB (once), and IC1 (once). Cohesive ties applied included IIA1 (six times), IIB1 (three times), and IIB4 (once).

Samples for Read and Write included two summaries by keyboard (7 sentences) and one by stylus (4 sentences). The child produced no writing for four keyboard lessons and wrote an irrelevant running commentary for one lesson. He wrote nothing for three stylus lessons and produced illegible writing for one. A limited range of translation strategies were employed – IA1 (5), IA2 (1), and ID3 (3) at Level I, and IIA1 (4) at Level II. One sentence was copied with a slight word change. Five of the total sentences provided accurate details from the source, while two posed inaccuracies and four provided irrelevant remarks. Across summaries, the child stated the main idea inaccurately for two summaries and did not write a main idea for the third one.

No writings samples were analyzed for this child's Listen and Write. Keyboard samples were excluded for the following reasons: no writing produced for three lessons, irrelevant commentary written for one lesson, and an irrelevant letter to the researchers composed for another lesson. Stylus samples were excluded for these reasons: no writing produced for one two lessons, illegible handwriting for three lessons, and running commentary written for one lesson.

Student 18 (female, grade 7). For autobiographical writing, the complete stylus samples amounted to a total sentence count of 49, while the single keyboard sample had 18 sentences.

Across the samples, the child wrote a large number (22 times) of Level I translation strategies that described observable behavior, IA8 (e.g. At the beach I sometimes go wading in the water or run along in the sand). The child also utilized translation strategies IA1 (4 times), IA2 (5 times), IA3 (13 times), IA4 (four times), IA8 (10 times), IA11 (once), IA12 (twice), IB (eight times), IC1 (three times), and ID3 (three times). Use of higher level translation strategies included IIA1 (38 times), IIA 2 (10 times), and IIB1 (three times).

Although missing one summary by keyboard (no text was produced) for Read and Write, the child produced more sentences by keyboard (57) than by stylus (37). A variety of Level I translation strategies were employed – IA1 (most frequently, 49), IA2 (6), IA3 (1), IA4 (4), IA6 (3), IA8 (8), IA11 (1), IA12 (1), IB (3), IC1 (1), ID2 (1), and ID3 (1). At Level II, he applied IIA1 (most frequently, 22), IIA2 (2), IIB4 (1), and IIB5 (1). For total sentences, nine were copied from the prompt with slight word change(s) and one with a slight syntax change. In addition, seven of twelve summaries copied the sentence organization of the text source. The child stated a main idea for one summary, but this was inaccurate. In terms of content, across all samples, 65 sentences presented accurate details from the text, 18 posed inaccurate understandings, and 11 stated irrelevant information.

For Listen and Write, the sample was short two keyboard lessons (no writing produced). For the collected samples, the child wrote 20 sentences by keyboard and 35 by stylus. These sentences were most frequently coded as IA1 (42). Other Level I translation strategies included IA2 (3), IA5 (2), IA6 (2), IC4 (1), and ID3 (2). Level II translation strategies were limited to IIA1 (7), IIA2 (1), and IIB1 (3). For total sentences, she copied two sentences directly from the source. One of her summaries also presented information in the same order as sentences in the source, although the copied sentences were not found in this sample. She stated a main idea for

four summaries – three accurately. Overall content consisted of 45 text-based factual details, three inaccuracies, and seven irrelevant details.

Across both sets of Read and Write and Listen and Write summaries, this child wrote more sentences when the source was read (94), compared to when it was heard (55). However, the Listen and Write was short one more sample. Across all samples, the child applied more IA1 at Level I and IIA1 at Level II. For Read and Write, over a third of sentences were irrelevant or inaccurate, compared to a quarter for Listen and Write. In addition, when presented with a written source to read, she tended to copy the organization of sentences in the source into her summaries.

Student 19 (male, grade 6). Although the child was missing one autobiographical essay by keyboard, almost the same amount of sentences was written for each mode (22 sentences by keyboard, 28 by stylus). His writing applied several translation strategies for writing the next sentence – IA1 (7 times), IA2 (9 times), IA3 (9 times), IA4 (10 times), IA6 (10 times), IA8 (three times), IA12 (once), IB (4 times), IC1 (3 times), IC2 (once), IC3 (once), IC4 (once) and ID3 (three times). The Level II translation strategy used the most was IIA2 (19 times), followed by IIA (3 times) and IIB1 (twice).

Only one summary by keyboard (4 sentences) and one by stylus (4 sentences) were collected for this child's Read and Write samples. Excluded were five keyboard texts that were exact copies of the prompt and three stylus that were illegible, off topic or a litany of random facts. The child employed IA1 (6) at Level I and IIA1 (2) at Level II. Of the total sentences, two were word-for-word copies of the text source and one copied with a slight word change. Six sentences provided factual details and two stated inaccuracies.

The child produced eight keyboard sentences and nine stylus sentences for the four summaries collected for the Listen and Write analysis. He did not produce at text for four keyboard summaries. Stylus writings were excluded for the following reasons – one lesson presented a subject-related running commentary, one listed notes from the source, and two contained random words. The child applied a limited number of translation strategies – IA1 (13) and ID3 (3) at Level I; and IIB1 (1) and IIB6 (1) at Level II. One sentence was copied verbatim from one source. This sentence, however, was not included in the one summary that copied the sentence order of another prompt. She wrote two main ideas that were stated accurately. The content of her summaries included 14 text-based facts, one inaccurate statement, and 2 irrelevant remarks.

This child completed very few summaries (total 6) – and sentences – across both Read and Write and Listen and Write. Whether information is presented by listening or reading, the translation strategy she applied most frequently was IA1. A review of her summary content suggests that the information she did present in her writing mostly conveyed accurate text-based details, compared to irrelevant or inaccurate details.

Student 20 (male, grade 6). For autobiographical writing, this child wrote more sentences for keyboard (35) versus stylus (23). A wide range of Level I translation strategies for writing the next sentence were employed – IA1 (twice), IA2 (five times), IA3 (three times), IA4 (8 times), IA6 (13 times), IA8 (four times), IA11 (seven times), IA12 (twice), IA13 (once), IA15 (once), IA16 (twice), IA17 (three times), IB (12 times), IC1 (three times), IC3 (three times), ID1 (three times), and ID3 (once). Most Level II cohesive ties were IIA1 (29 times), while others included IIA2 (once), IIB1 (6 times), and IIB6 (once).

Although one summary by keyboard was excluded for irrelevant writing, the child still wrote more sentences by this mode (44) than by stylus (34). He applied a wide range of Level I translation strategies – IA1 (most frequently, 56), IA2 (4), IA5 (1), IA6 (1), IA8 (3), IA11 (11), IA16 (2), IB (2), IC1 (2), IC3 (1), and IC4 (1); as well as Level II – IIA1 (most frequently, 34), IIB1 (6), IIB4 (2), and IIB 6 (2). He copied one sentence verbatim and one with slight word change(s). These sentences also presented more text-based factual details (67) than inaccurate (8) or irrelevant statements (3). Across summaries, only three did not include a main idea. In the summaries with a main idea, seven were stated accurately and only one inaccurately.

For Listen and Write, one keyboard text was excluded because the child wrote a running commentary about the subject. Regardless, he wrote more sentences by keyboard (45) than by stylus (36). For these, he employed a wide variety of translation strategies at both Level I – IA1 (most frequently, 41), IA2 (5), IA3 (2), IA4 (4), IA5 (2), IA6 (1), IA8 (3), IA11 (15), IB (4), IC1 (4), IC3 (2), and ID3 (10); and Level II – IIA1 (most frequently, 45) and IIA2 (2), with genre-level cohesive ties IIB1 (most frequently, 8), IIB4 and IIB6 (3). He wrote all sentences in his own words and did not copy the organization of information in the sources. In terms of content, he included a main idea in nine summaries – with only two stated inaccurately. Most sentences presented accurate text-based details (58), compared to nine inaccurate details and fourteen irrelevant remarks.

Across the total samples collected for Read and Write and Listen and Write, the child wrote slightly more sentences when the text information was heard (81) than read (78). He also wrote more by keyboard. For either mode of presentation (heard or read), he was able to articulate a main idea when one was written. However, more than a third of total sentences for

Listen and Write were irrelevant or inaccurate, compared to less than a quarter for Read and Write.

Student 21 (male, grade 6). No keyboard samples were available for this child. He wrote 18 sentences by keyboard that utilized Level I translation strategies for IA2 (3 times), IA3 (once), IA4 (once), IA6 (4 times), IA13 (once), IB (four times), IC1 (once), IC2 (twice), IC4 (once), and ID3 (four times). Level II cohesive ties included IIA1 (five times), IIB1 (twice), and IIB6 (three times).

Although the child produced two less Read and Write summaries by keyboard, he produced more sentences with this mode (46) than by stylus (32). The range of Level I translation strategies he used includes IA1 (most frequently, 31), IA2 (9), IA3 (1), IA11 (1), IB (1), IC1 (2), IC2 (3), IC3 (1), ID1 (1), ID3 (11), and ID4 (1). Level II translation strategies include IIA1 (most frequently, 37), IIB1 (3), and IIB6 (1). In terms of summary content, 36 sentences provided factual information from the text, which were outnumbered by 21 inaccurate text-based statements and 21 irrelevant statement. Across summaries, the child copied the organization of presented information for two summaries. He also stated three accurate versus four inaccurate main ideas for seven summaries.

For Listen and Write, the child did not produce a text for two stylus lessons and four keyboard lessons. Regardless, he wrote more sentences by keyboard (25) versus stylus (16). The range of Level I translation strategies he employed for these sentences include IA1 (most frequently, 16), IA2 (3), IA3 (1), IA11 (1), IB (2), IC1 (1), IC3 (2), ID2 (1), ID3 (7), and ID4 (2). For Level II, he employed IIA1 (most frequently, 9) and IIA2 (1) and genre-level IIB1 (4), IIB3 (2) and IIB6 (3). Although one summary was organized according the order information was

presented in the prompt, the one sentence he copied verbatim was included in another summary. Content was comprised of 21 text-based details, seven inaccuracies, and 13 irrelevant statements.

Across the total Read and Write and Listen and Write samples, this child wrote more sentences when the information was read (78) versus heard (41). He employed a wide range of Level I translation strategies, although mostly IA1. Furthermore, close to a third of his sentences evidenced use of a Level II cohesive translation strategies. A range of genre-level cohesion was also in use for both presentation modes. For all summaries, over half of the stated main ideas were accurate. However, in either Read and Write or Listen and Write, the content of his writings evidenced an equal number of irrelevant and inaccurate statements, compared to accurate text-based statements.

Student 22 (female, grade 6). An equal number of sentences (28) were written for each mode in the autobiographical task, even though one less keyboard text was completed. This child employed the following translation strategies – IA1 (five times), IA2 (4 times), IA3 (5 times), IA4 (nine times), IA6 (six times), IA12 (five times), IA17 (twice), IB (11 times), IC1 (eight times), IC2 (three times), IC3 (twice), ID1 (once), and ID3 (five times). Translation strategies for discourse structure were mostly IIA (19 times), while others included IIB1 (three times), IIB6 (once).

For Read and Write, the child wrote only 2 summaries by stylus (9 sentences). No writing was produced for four keyboard lessons and three stylus lessons. Other writings were excluded because sentences were copied directly from the source. A limited number of strategies were employed at Level I – IA1 (6), IC3 (1), and ID3 (1); and none at Level II. Of the total sentences, six provided factual details, two posed inaccuracies, and one presented an

irrelevant remark. No main idea was stated for one, but an inaccurate main idea was written for the other.

For Listen and Write, reasons for missing texts included no writing produced for four keyboard and two stylus lessons, an irrelevant running commentary written for one stylus lesson, and sentence fragments written for another stylus lesson. The child produced a total 10 sentences by keyboard and five by stylus for summaries included in the analysis. She applied mostly IA1 (7), but also included IA17 (1), IC1 (1), ID3 (1), and one Level II translation strategy (IIA2). Only one main idea was stated across the four samples, albeit incorrectly. Fact details totaled six – an amount less than the combined inaccurate (6) and irrelevant (3) statements.

Across the Read and Write and Listen and Write tasks, the child wrote little (a total 28 sentences over six summaries). For most lessons, she produced no writing. The content of her summaries presented an equal number of accurate (12) to a combined number of inaccurate/ irrelevant statements (12). She did not compose an accurate main idea for any summary.

Student 23 (male, grade 6). This child wrote six sentences in one sample of autobiographical writing by keyboards, and 27 sentences for two samples by stylus. His sentences were coded for IIA2 (twice), IA3 (once), IA4 (six times), IIA6 (six times), IA8 (six times), IA12 (twice), IC1 (twice), IC2 (once), IC4 (once), ID1 (five times), and ID3 (three times) at Level Ifor writing the next sentence. Sentences also applied Level II translation strategies for connecting sentences – IIA1 (15 times) and IIA2 (three times), as well as genre-level translational strategies – IIB1(three times).

For the Read and Write summaries, keyboard texts were not available for two samples (no summary written for one lesson, narrative written for the other) and stylus texts by three texts (running commentary written for two lessons, no summary written for one). The child produced

18 sentences by keyboard and 12 by stylus. Level I translation strategies include IA1 (most frequently, 20), IA2 (2), IA4 (1), IC2 (1), IC4 (1), and ID3 (2). Level II translation strategies include IIA1 (4), IIA2 (1), IIB1 (1) and IIB6 (1). Only one text included a main idea, which was stated accurately. Across summaries, 20 sentences provided factual details, 4 inaccurate details, and 6 irrelevant statements.

The reasons for missing texts for Listen and Write include no text written for one keyboard and two stylus lessons, as well as one excluded commentary written by stylus. For the collected samples, the child wrote 14 sentences by keyboard and seven by stylus. The majority of sentences were IA1 (15), but also included IA2 (2), IA11 (1), IC2 (1), and ID2 (1). The only Level II translation strategy was IIA1 (3). Only one sentence was copied verbatim from the prompt. Three of four main ideas stated were written accurately. Summaries were comprised of 16 text-based details, one inaccuracy, and four irrelevant statements.

Over two-thirds of the total 51 statements across Read and Write and Listen and Write were accurate information taken from the sources. However, that reveals a remaining third of the child's writings – total 15 inaccurate and irrelevant statements – did not contribute to the content of the summaries. Moreover, the child presented a main idea for only a quarter of the summaries.

Student 24 (male, grade 6). For autobiographical writing, this child wrote more sentences by keyboard (62) than by stylus (37). A large number of sentence to sentence translation strategies were employed for IA1 and IA3 (at 11 times each), IA4 and IA6 (at 25 times each). Other translation strategies used were IA 2 (5 times), IA8 (three times), IA9 (once), IA11 (five times), IA12 (twice), IA13 (twice), IA17 (once), IC1 (five times), IC2 (once), IC3 (six times), IC4 (twice), and ID3 (three times). The greatest amount of cohesive ties was applied

for IIA1 (39 times), with genre-level translational codes for IIB1 (five times), IIB5 (once), and IIB6 (once).

For Read and Write, the child did not write anything for one stylus and one keyboard lesson. One keyboard sample was also excluded because the whole text comprised sentences copied directly from the source. For the samples in the analysis, the child wrote 23 sentences by keyboard and 29 by stylus. He employed a variety of Level I translation strategies– IA1 (most frequently, 41), IA2 (3), IA5 (1), IA9 (1), IB (1), and ID3 (1); and Level II translation strategies – IIA1 (6), IIB1 (1), and IIB3 (1). The sentences in six summaries presented information in the same order as the original prompt, with one sentence copied verbatim and one other copied with a slight word change. In terms of content, 41 sentences relayed factual information, six revealed misunderstanding of the source, and five stated irrelevant information.

Across the Listen and Write summaries, the child produced nine sentences by keyboard and 20 by stylus. However, three keyboard summaries were missing (no text produced for two lessons and an exact copy of the prompt was written for the other). Level I translation strategies he applied were IA1 (most frequently, 22), IA (1), IA11 (2), and ID2 (1). The only Level II he used was IIA1 (3). One of these statements was a verbatim copy of a sentence from a text source. Additionally, the child copied the sentence organization of two summaries. He was able to write a main idea for seven summaries. The content of his writing were mostly factual details (22), but also included six inaccurate statement of text-based information and one irrelevant detail.

As a whole, the child wrote more sentences for Read and Write (52) than for Listen and Write (29). The same number of summaries was produced across both modes of text presentation. He was also able to articulate an accurate main idea for over half his summaries

(10 of 18). However, presented with a written source to read, he tended to copy the organization of information from the sources when writing his summaries. In general, more of his writings contained relevant text-based details (63) compared to those that were inaccurate or irrelevant to the summary (combined 18). The mode of presentation did not seem to affect his understanding (misunderstanding) of details in the sources.

Student 25 (male, grade 6). This child produced slightly more total sentences by keyboard (50) than by stylus (43) for his autobiographical writings. Translational strategies he applied for writing the next sentence were IA1 (twice), IA2 (21 times), IA3 (17 times), IA4 (8 times), IA5 (once), IA6 (30 times), IA8 (five times), IA11 (nine times), IA16 (twice), IA17 (14 times), IB (11 times), IC1 (4 times), IC2 (three times), IC3 (twice), IC4 (twice), ID1 (once), and ID3 (five times). Translation strategies applied for higher-level discourse structure were mostly for IIA1 (49 times), with some IIA2 (twice) and genre-specific IIB1 (five times).

For Read and Write, the sample was short four keyboard summaries (no text written for two lessons, and off topic writing for other two). The child composed eight sentences by keyboard and 40 by stylus. He employed mostly IA1 (19), but also included IA2 (5), IA3 (3), IA6 (3), IA15 (1), IA16 (2), IB (3), IC1 (2), IC2 (3), ID2 (2), and ID3 (3). At Level II, he used IIA1 (13), IIA2 (2), IIB1 (2), and IIB3 (1). Across the samples, he wrote a main idea in four summaries, three of which were accurately stated. The content his writings comprised 21 factual statements based on the readings, seven showing a misunderstanding of the source, and 20 relaying irrelevant information.

For Listen and Write, the child did not produce a text for one stylus and two keyboard lessons. One stylus lesson was excluded for off-topic writing. Of the eight summaries analyzed, the child wrote more sentences by keyboard (26) versus stylus (22). He applied mostly IA1 (25)

at Level I, but also used IA2 (4), IA3 (2), IA11 (2), IA15 (1), IA16 (2), IC2 (1), IC2 (2), ID2 (2), ID3 (6), and ID4 (1). Level II cohesive ties he applied were IIA1 (4), IIA2 (1), and IIB1 (3). He wrote a main idea (all accurate) for three summaries. Content of his summaries are comprised of 24 text-based details, five inaccuracies, and 19 irrelevant statements.

The child composed an equal number for both Read and Write (48) and Listen and Write (48). For Listen and Write, he employed more IA1 (statement of facts). However, he applied more Level II translation strategies for Read and Write. For content, the numbers between Read and Write and Listen and Write do not differ greatly for the presence of accurate, inaccurate and irrelevant statements. In both cases, the total inaccurate and irrelevant statements almost equal the number of text-based relevant details. An equal number of main ideas were also included in both presentation modes. His comprehension of information from the sources did not seem to depend on the mode of presentation.

Student 26 (male, grade 8). In his autobiographical writings, this child wrote more than twice the number of sentences by keyboard (39) versus by stylus (16). The range of sentence to sentence translation strategies he employed in his writing includes IA1 (six times), IA2 (three times), IA3 (five times), IA4 (four times), IA6 (14 times), IA8 (six times), IA11 (three times), IA12 (12 times), IB (once), IC1 (four times), ID1 (once), ID2 (once), and ID3 (twice). Translation strategies for discourse structure include IIA1 (18 times) and IIB1 (three times).

For Read and Write, the child composed 22 sentences by keyboard and 15 by stylus (two stylus texts were excluded for unreadable handwriting). The most frequent Level I translation strategy he employed was IA1 (27). Others included IA2 (3), IA9 (1), IA11 (2), IB (1), and IC1 (1). For Level II, he used IIA1 (5) and IIB1 (3). Furthermore, although he wrote a main idea for

four summaries, only two were stated accurately. Sentences totaled 32 factual text-based details, one inaccurate detail, and four irrelevant remarks.

With two stylus texts excluded for illegible handwriting, the child wrote 24 sentences by keyboard and 10 by stylus for Listen and Write. Most sentences he wrote applied translational strategy IA1 (22). Others at Level I included IA2 (1), IA3 (1), IA16 (1), IA8 (1), IA9 (1), IA11 (2), IB (3), and IC1 (3). At Level II he used mostly IIA1 (8), but also IIB1 (5) and IIB3 (1). For six summaries, he wrote an accurate main idea. The content of his writings were composed of 20 accurate details from the prompt, one inaccurate statement, and four irrelevant details.

Across the complete sample of summaries, the child wrote slightly more sentences for Read and Write (37) than for Listen and Write (34). For both, he employed more Level I IA1 and Level II IIA1. However, more translation strategies were applied for Listen and Write. More main ideas were stated for summaries written from the heard prompt – all accurately, than for the read prompt. In general, the child wrote an equal number of inaccurate statements (one each) and irrelevant details (four each) across both modes. Most sentences reflected accurate information from the sources. The mode of presentation did not seem to hinder his comprehension.

Student 27 (male, grade 6). One autobiographical writing sample by keyboard was missing, but this child wrote 21 sentences by stylus and seven by keyboard. The Level I translation strategies he applied were IA1 (four times), IA2 (four times), IA3 (three times), IA4 (three times), IA6 (six times), IA8 (three times), IA11 (once), IA12 (once), IB (three times), IC1 (twice), IC2 (once), ID2 (once), and ID3 (six times). Level II translational strategies applied were IIA1 (12 times), IIA2 (once), and genre-specific IIB1 (once).

Although the summaries by keyboard were short two samples (no text written for one lesson and off topic writing for the other) for the Read and Write tasks, the child wrote almost as much sentences by keyboard (12) as stylus (14). The variety of translation strategies he used included IA1 (most frequently, 18), IA5 (3), IA6 (1), IA8 (2), IA9 (2), IA11 (6), IB (1), IC2 (1), and ID3 (6) for Level I; and IIA1 (5), IIB1 (1), and IIB3 (1) for Level II. The child wrote a main idea in four samples; all were accurately stated. Content included 17 factual details, 4 inaccurate details, and 5 irrelevant remarks.

With no writing produced for three keyboard lessons, the child's sentences totaled 12 for keyboard and 17 for stylus in the Listen and Write tasks. Level I translation strategies employed were IA1 (most frequently, 14), IA2 (1), IA11 (4), IB (1), IC1 (1), and ID2 (5). Level II translation strategies included IIA1 (9), IIB1 (1) and IIB6 (1). The child copied the sentence organization of one summary. In terms of content, four included an accurate main idea. Over all summaries, factual details totaled 17 sentences, with inaccurate statements (6) and irrelevant details (6) comprising the rest of the compositions.

As a whole the child wrote only slightly more sentences in Listen and Write (29) compared to Read and Write (26). Although the child applied mostly translation strategy IA1, he employed more Level I translation strategy when the sources were read than heard. For both presentation modes, he also applied mostly Level II IIA1. In terms of content, he wrote an equal number of accurate details. However, slightly more inaccurate and irrelevant statements were noted for Listen and Write than for Read and Write.

Student 28 (female, grade 6). This child wrote more sentences by stylus (45) than by keyboard (17), although total autobiographical samples were short one keyboard text. The translation strategies he used the most for writing sentence to sentence included IA1 (27 times),

IA4 (19 times), IA4 (10 times), and IA6 (17 times). Other Level I strategies were IA3 (twice), IA8 (twice), IA11 (five times), IA15 (once), IB (seven times), IC1 (six times), IC2 (twice), ID2 (twice), ID3 (five times), and ID4 (once). A large number of IIA1 (38 times) translation strategies were applied to connect sentences. Other Level II translation strategies were IIA2 (four times) and genre-specific IIB1 (three times) and IIB5 (once).

Excluded from the Read and Write analysis were one keyboard text (writing copied fully from prompt) and one stylus text (writing comprised off-topic statements). For the included samples, the child's sentences totaled 26 for keyboard and 13 for stylus. Applied translation strategies were limited to IA1 (most frequently, 24), IA2 (6), IA3 (2), IB (1), IC1 (2), IC2 (1), ID2 (3), ID3 (2) and ID4 (1) at Level I; and IIA1 (5) and IIB6 (1) at Level II. One of these sentences was copied directly from the source; one other copied with a slight word change; and another with a change in syntax. For one summary, the child presented sentences in the same order as the text source. Although she stated a main idea in seven summaries, only three were accurate. In terms of content, the summaries comprised 23 text-based facts, three inaccurate details, and 13 irrelevant statements.

The Listen and Write sample was short three summaries. Reasons include no writing produced for one keyboard lesson, illegible handwriting for one stylus lesson, and off topic writing for another stylus lesson. Across the analyzed summaries, the child wrote 28 sentences by keyboard and 26 by stylus. She applied mostly IA1 (28) at Level I, but also used IA2 (11), IA3 (2), IA5 (5), IA6 (1), IA9 (1), IA11 (6), IB (1), IC1 (3), IC4 (1), ID2 (2), and ID3 (1). At Level II, she mostly employed IIB1 (3), but also IIA1 (1) and IIA2 (1). In terms of content, she wrote a main idea for all summaries. However, only four were stated accurately. Her sentences

consisted mostly of irrelevant statements (25), in addition to four inaccurate statements and 24 text-based details.

For all summary samples, the child wrote more sentences for Listen and Write (54) than for Read and Write (39) – despite one more missing text for the listening mode. The child also utilized more translation strategies for Listen and Write. For both presentation modes, IA1 was the most frequently used translation strategy. The content of summaries, however, shows that the child wrote more irrelevant and inaccurate statements, compared to accurate details, for Listen and Write. Interestingly, she was also able to accurately present a main idea for more summaries in this presentation mode than for Read and Write.

Student 29 (male, grade 6). One writing sample by each mode was missing. However the sentence total for keyboard (48) was greater than for stylus (44). The Level I translation strategies he employed the most were IA1 (27 times), IA4 (19 times), IA6 (16 times), IA11 (21 times), and IB (30 times). He also used IA2 (8 times), IA3 (six times), IA9 (four times), IA12 (once), IA13 (once), IA16 (once), IC1 (eight times), IC3 (thrice), IC4 (once), and ID3 (once). For Level II translation strategies, the child employed IIA1 (23 times) and IIA2 (three times), and IIB6 (twice). Of all the children, his writings employed the most number of topic sentences (11 times for IIB1).

With one keyboard summary excluded from the Read and Write analysis, the child wrote more sentences by keyboard (45) than by stylus (22). He applied IA1 (42) with the most frequency. Others included IA2 (4), IA4 (1), IA11 (5), IB (2), IC1 (2), IC2 (1), IC3 (3), ID2 (2), and ID3 (4). At Level II, he used IIA1 (most frequently, 18), IIA2 (2), IIB1 (2) and IIB6 (1). One of his sentences was copied verbatim and another with a slight change in syntax. For four summaries, these sentences presented information in the same order as the text prompt. In

addition, three summaries included an accurate main idea. The child stated inaccurate main ideas for an additional two summaries. Content included 42 text-based facts, 10 inaccuracies, and 15 irrelevant statements.

For Listen and Write, the child wrote almost twice the amount for keyboard (56) compared to stylus (24). The majority of Level I translation strategies he applied was IA1 (55), followed by IA11 (16). Also used were IA2 (2), IA4 (2), IA5 (1), IA9 (2), IB (5), IC1 (5), IC2 (1), IC3 (1), ID2 (2), and ID3 (3). He also applied several Level II cohesive ties – IIA1 (most frequently, 14), II2 (3), and IIB1 (6). Content of the summaries included two sentences copied verbatim from the sources. The child also copied the sentence organization of the prompt in writing four summaries. In addition, six of seven stated main ideas were accurate. Overall, most of the sentences stated accurate text-based details from sources (54). However, a number showed a misunderstanding of the text source (3) and presented irrelevant information (23).

Regardless of writing mode, the child wrote more sentences for Listen and Write (80) than for Read and Write (67). Although IA1 was employed most frequently across both tasks, more Level I sentence to sentence translation strategies were used in Listen and Write. The child produced sentences according to the organization of information in the prompt equally across Read and Write and Listen and Write. Although a high number of irrelevant and inaccurate statements were written across all summaries, proportionally more were included in Listen and Write.

Student 30 (male, grade 6). This child wrote more sentences by keyboard (25) compared to stylus (19) for the total autobiographical writing tasks. The variety of translation strategies for writing the next sentence included IA1 (nine times), IA2 (six times), IA3 (once), IA4 (six times), IA6 (16 times), IA8 (three times), IA12 (four times), IA15 (once), IA16 (once),

IB (three times), and ID3 (once). Cohesive ties applied were IIA1 (16 times), IIA2 (once), IIB3 (once), and IIB5 (twice).

The child composed 17 keyboard sentences and 13 stylus sentences for ten Read and Write samples. For the two missing texts, he did not write a text for one stylus lesson, and he copied directly from the text for one keyboard lesson. Across samples, the child employed IA1 (most frequently, 20), IA2 (4), IA11 (1), IB (1), and ID3 (1) for Level I; and IIA1 (2), IIA2 (3), and IIB1 (2) for Level II. Although the information was not presented in parallel to the order of sentences in the text, some sentences were taken directly from the prompt (six copied verbatim, two copied with a word change, and 2 copied with a slight change in syntax). Three of the four summaries he stated were accurate. Content included 20 text-based details, five inaccuracies, and five irrelevant details.

For Listen and Write, only six summaries were analyzed. The child produced no text for one keyboard and two stylus lessons. An additional two keyboard texts were excluded for off-topic writing. For the written summaries, the child wrote eight sentences by keyboard and six by stylus. Most sentences were categorized as IA1 (6). The remaining sentences were coded as IA2 (2), IA4 (1), IA7 (1), IA8 (1) and IB (2). Level II translation strategies included IIA1 (4) and IIA2 (1). One sentence was copied word-for-word from the prompt. The two main ideas written were correctly stated. Content consisted of six factual details, three inaccurate statements, and five irrelevant details.

The combined irrelevant or inaccurate statements outnumbered accurate statements for Listen and Write. On the other hand, a third of Read and Write statements were either inaccurate or irrelevant.

Student 31 (male, grade 6). Only one writing sample by keyboard (14 sentences) and two by stylus (20 sentences) were completed. Level l translation strategies employed were IA2 (six times), IA3 (eight times), IA4 (three times), IA6 (seven times), IA8 (three times), IA16 (once), IA17 (10 times), IB (twice), IC1 (three times), IC3 (six times), ID1 (twice), ID3 (four times), and ID4 (twice). The only Level II translation strategies he used were IIA1 (10 times) and IIB1 (three times).

For Read and Write, only two summaries by keyboard (17 sentences) and two by stylus (16 sentences) were analyzed. The child did not write a text for four keyboard and three stylus lessons. An additional stylus keyboard was excluded because the child wrote an irrelevant running commentary on the subject. He applied a wide range of translation strategies at Level I – IA1 (most frequently, 19), IA2 (6), IA6 (2), IA8 (1), IA9 (2), IA11 (2), IA16 (1), IA17 (1), IB (6), IC1 (2), IC2 (3), ID2 (1), and ID3 (5); and at Level II – IIA1 (most frequently, 11), IIA2 (1), IIB1 (6), IIB2 (1), and IIB6 (1). In the one summary that copied the organization of sentences in the source, the child also copied two sentences verbatim, one with a word change, and two with a slight change in syntax. He did not write a main idea for this summary. For the other three, he stated an accurate main idea. Content included 19 text-based facts, three inaccurate details, and 11 irrelevant statements.

Only three Listen and Write summaries were available for analysis – two keyboard and one stylus. Reasons for missing texts include no texts produced for four keyboard and three stylus lessons and irrelevant running commentaries written for two stylus lessons. For the three samples in the analysis, the child wrote 18 sentences by keyboard and five by stylus. The range of Level I translation strategies applied were IA1 (most frequently, 11), IA2 (3), IA5 (2), IB (5), IC1 (2), and ID3 (2). At Level II, the child used mostly IIA1 (5), but also IIB1 (2). Although he

wrote a main idea for two summaries, only one was stated correctly. Content of his writings consisted of 10 text-based facts, six inaccurate statements, and seven irrelevant details.

Regardless of how the source was presented—visually or aurally, the child used IA1 most frequently. However, he applied more translation strategies, across levels, in his Read and Write summaries. He also relied more heavily on the written text sources. His writings reflected copied sentences and text organization. On the other hand, the amount of irrelevant and inaccurate statements outnumbered accurate details in his Listen and Write summaries. Irrelevant and inaccurate information in Read and Write, however, were only slightly less than the accurate statements.

Student 32 (male, grade 6). All autobiographical texts by stylus were illegible. For the 24 sentences by keyboard, the child applied IA1 (four times), IA2 (nine times), IA3 (three times), IA4 (twice), IA6 (five times), IA15 (once), IC1 (twice), and ID3 (once) at Level I; and IIA1 (five times), IIB1 (twice), and IIB5 (twice) at Level II.

Only three keyboard samples were collected for this child's Read and Write (12 sentences). He did not write a summary for three keyboard lessons, and he produced unreadable texts for all stylus lessons. The child employed only two translation strategies, IA1 (7) and IA5 (1). Main ideas were not stated. Content included five text-based facts, four misunderstanding of information, and three irrelevant details.

For Listen and Write, one keyboard and all six stylus texts were excluded for illegible writing. The amount of misspellings in the keyboard text made it difficult to understand what the child wrote. An additional two keyboard samples were missing because the child produced no text. The limited number of Level I translation strategies applied were IA1 (most frequently, 7), IA2 (2), IA5 (1), and ID3 (2). No Level II translation strategies were employed. Only one

summary included a main idea, which was stated correctly. In terms of content, the child wrote seven text-based statements, one inaccurate detail, and five irrelevant remarks.

Across both samples of Read and Write and Listen and Write, the child wrote almost the same number of sentences. Level I translation strategy IA1 was used equally. For summaries written when the prompt was heard, the child produced more almost as many irrelevant and inaccurate statements as relevant text-based details. For read summaries, accurate statements were outnumbered by the combined irrelevant and inaccurate details.

Student 33 (male, grade 6). This child wrote more sentences by stylus (29) than by keyboard (16) across the sample of autobiographical texts. For writing the next sentence, he employed translation strategies that included IA1 (seven times), IA2 (three times), IA7 (seven times), IA4 (most frequently,16 times), IA6 (four times), IA8 (once), IB (six times), IC2 (once), ID2 (once), and ID3 (nine times). For connecting sentences, he applied translation strategies that included IIA1 (three times), IIA2 (five times), IIB1 (three times), and IIB5 (once).

With three missing keyboard texts (no writing, off topic writing, and irrelevant commentary) and two missing stylus texts (one off topic and one irrelevant commentary), the child wrote 13 sentences by keyboard and 10 by stylus for Read and Write. Translation strategies he used were IA1 (most frequently, 8), IA2 (1), IA11 (1), IC1 (1), IC2 (2), and ID3 (1) at Level I; and IIA1 (4) at Level II. Content included eight factual details, which were outnumbered by 10 inaccurate text-based details and five irrelevant statements.

For Listen and Write, five summaries were collected for analysis. No texts were produced for one stylus and one keyboard lesson. The child wrote an irrelevant running commentary for two keyboard lessons, and wrote off topic for one keyboard and one stylus lesson. He produced a total of 11 sentences by keyboard and 12 by stylus. The most frequent

Level I translation strategy was IA1 (13). Also employed were IA2 (4), IA4 (1), IA11 (1), and ID2 (1). At Level II, only IIA2 (1) was used. Only one summary included a main idea, which was stated accurately. Factual details totaled 13. This number was only slightly more than the combined inaccurate (3) and irrelevant (7) statements.

Collectively, the child wrote an equal number of sentences for both Read and Write and Listen and Write. More of the Listen and Write sentences used IA1. Looking at writing content, the child also produced slightly more factual statements for this mode than inaccurate or irrelevant details.

Pretest and Posttest Normed Measure of Translation Strategies at Sentence Level

Sentence Combining, which is sensitive to written expression of thought at the syntax level, is currently a topic of much developmental and instructional research on writing (e.g. Myhill, 2009; Saddler & Graham, 2005). WIAT3 Sentence Combining (Pearson, 2009) was given before and after the students completed the computerized intervention. The task was to combine two provided sentences into one well written sentence that contains all the ideas in the two separate sentences (test-retest reliability .81). The score is a standard score (M=100, SD=15).

On WIAT 3 Sentence Combining the mean score of the first 33 children to complete the 18 computerized lessons was 94.18 (SD=14.16). After completing the 18 lessons, the mean was 99.59 (SD=13.72). This is a statistically significant change, t =-2.44, p=.03.

CHAPTER 7: STUDY 2 DISCUSSION

Did Students Show Evidence of Using Taught Translation Strategies?

A primary aim of this research was to determine if teaching children to use a variety of translation strategies for writing the next sentence would result in use of the strategies. Although no causal claims are made between the computerized strategies instruction and the occurrence of coded translation strategies within children's writings, the compositions across the autobiographical essays and summaries did show evidence that some of the taught translation strategies were used in the students' compositions. Moreover, the teachers observed students clicking on the link to review the strategies while composing.

Did Students Show Variability among Each Other in Translation Strategies Used?

Whereas Study 1 documented developmental variability in use of the translation codes, Study 2 documented individual differences in employment of the translation strategies. Children's autobiographical writings evidenced a wide range of translation strategies. Overall, based on group analyses, all translation strategies except *tell the next step* and *define what something is not* were used (see Table 7). Individually, children's writings tended to apply a limited set of translation strategies for any given composition, regardless of sentence count. For example, student 29 wrote an autobiographical essay of 30 sentences in lesson six. The writing prompt required children to write their interests in and out of school. The child's essay for this lesson accounted for the largest number of sentences in an essay for the group as a whole. Yet, only a subset of 10 Level I *write the next sentence* translation strategies and two Level II *cohesive ties* was applied to the composition. In the first 11 lines of that essay, example below, he used only four Level I translation strategies– IA6 *describe observable behavior*, IA11 *give an example*, IC4 *paraphrase,* and IB *explain.* At Level II, codes applied include IIA1 *connect*

sentences with a word and/ or sentence and IIA2 *interrupt idea in progress and continue with the thought*.

My interests in and out of school	[titles were not coded]
I like to Play minecraft which is a video game, that I like	IA11
a video game that I like is minecraft.	IC4
minecraft is a video game I like.	IC4
I also like massing with people.	IA11; IIA1
I also enjoy playing with my friends.	IA11; IIA1
We all play minecraft	IA6; IIA1
minecraft is a video game we like.	IC4; IIA1
I like minecraft to because it's simple, but fun	IB; IIA1
its simple enough that you can do anything.	IB; IIA1
I also like to play on my wii	IA11; IIA2
my friends all play with me on it…	IA6; IIA1

In another composition from the same lesson six, another child's writing (student 11) employed six Level I (IA3 *describe by painting a picture with words,* IA4 *describe a state of mind or feeling,* IA6 *observable behavior,* IB *explain,* IC1 *qualify prior statement*, ID1*dialogue*) translation strategies and three at Level II (IIB1 *state a topic sentence for the sentences that follow*, IIA1 *connect with word and/or sentence*, IIA2 *interrupt idea in progress and continue with the thought*). The limited set of translation strategies applied to the entire composition of 10 sentences:

out side of school i like DOCTOR WHO because his mortal enimy are	
these robots	IA4, IB; IIB1

actuly robots is the wrong term IC1; IIA1

they are called DALEKS and are geneticly enginered. IA3 IC1; IIA1

they were made by this creep davoros IA1; IIA1

daleks have no legsand to replace the legs they have a sort of cone with a lot of bumps on it th IA3

i like to watch doctor who because i like aliens. IB

i also like monty pithon IA4; IIA1, IIA2

my favoret part is the BLACK KNIGHT because he is halarious. IC1, IB

he gets his arm cut off and king auther says, i have betten you worthy opponent IA6, ID1; IIA1

the black knight says, it is mearly a scratch. ID1; IIA1

the king yells A SCRATCH, your whole arm gone! ID1

the kni [*did not complete*]

Although both these examples were elicited from the same lesson prompt for writing about interests in and out of school, applied coded translation strategies did vary greatly, especially at Level I. Three of these codes were not used by student 29 in the last example, just as student 11 did not use IC4 *paraphrase* in his writing. Yet, such variation across writers and lessons would be expected based on the generativity of the translation processes—there are many different ways to transform ideas into written language and not all possible translation strategies are used across writing bouts, especially when writers are telling their personal stories.

Limited use of a core set of codes was observed for summary writing. No more than a set of five Level I and three Level II codes were applied to any given summary sample, regardless of sentence count. But again, in support of the generativity of the translation process, children's

summaries for the same lessons showed variability on which codes they employed – although less so, as most statements were *facts*. In the example below (Lesson 15 for Read and Write about the Mariana Islands), student 20 applied 4 Level I codes (IA1 *fact,* IB *explain,* IA6 *observable* behavior, IA8 *next* event) and 2 at Level II (IIB1 *topic sentence* and IIA1 *connecting word*).

The name Mariana, came from the Spanish after their queen who
had the same name. IA1, IB
It also means small islands and there is some history behind
those islands. IA1; IIA1, IIB1
The story starts when the native islanders stole a boat from
the Spanish. IA1, IA6; IIA1
The islanders did know it was wrong and a battle began because
of the disargrement IA1, IA8,
IB; IIA1 The Spanish renamed the islands "The Islands of Thieves."
IA1, IA8 Soon after the U.S. claimed the Guam Island and soon after that
the Spanish again renamed the islands to their current name
"The Mariana Islands. (IA2); IIA1
There is some more history In they were then sold to the German
but after WWI they were given [*did not complete*]

Compare with another child's writing below where most sentences for the same summary task (Lesson 15 Read and Write) were *statements of facts* listed directly from the source text:

The Mariana islands are in northern Microesia, a name combinding two greek words. IA1

The Spaniards named the island the island of theives. IA1

In the late 19th centery the US colonized Guam. IA1

15 of the islands are limestone and active volcano. IA1

Although fact statements comprised the majority their writing, variability in applied coding was still evident between the two summaries above. However, this variability was less so for summary than autobiographical essays in general. Most of the children's writings employed fact statements in summary writing, whether the source information was heard or read.

Do Translation Strategies Depend on Task at Hand?

Application of translational codes seems to depend on the nature of the writing task. On the one hand, possibly more variability in coded translation strategies for autobiographical essays was recorded because the nature of the task allowed for individual voice and creativity. On the other hand, the majority of sentences across summaries were coded as *statement of fact(s)*. Note that all source materials were expository rather than narrative. This genre, however, did not preclude children using typically narrative elements such as *describing behavior* and *telling the next event*. Children incorporated these elements when summarizing the events leading to the naming of the Mariana Islands (Lesson 15, Read and Write) or the independence of Mexico (Lesson 17, Read and Write), as shown by the example below:

mexico's diversity is a pround culture that has 62 different langueges in mexico. IA1

the people are a mix of races such as spainish uropean african and native people to that land. IA1, IA11

there are also 200,000 reptials in mexico. IA3; IIA1

mexico is in a tropical area and was taken over by spain in the early 1500's because spain wanted more gold. IA1, IB

after spain took over mexico it broke away after about 150 years. IA1, IA8; IIA1

mexico later became a independent nation and lost most of its land to america. IA1, IA8; IIA1, IIB6

Application of these translation strategies for *describing an observable behavior* or *telling the next event* would not have been appropriate for a summary on the diversity of Mexico (Lesson 17, Listen and Write), where the text prompt outlines Mexico's diversity:

there are around 150000 different species of biotics in mexico (IA2)

chocolate comes from mexico. IA1

there are hundreds of different cultres in mexico. IA1

each culture had different music and dances. IA1

mexico has one of the highest rudes of spanish speaking. IA1

Is the Distinction between Narrative and Expository Overly Simplistic?

According to Epstein-Jannai (2005), genre provides a framework within which discourse will be shaped. It places constraints on the way meaning will be created or synthesized. The challenge may be in helping children adhere to these conventions, while also providing guidance for developing and incorporating their unique voices to their compositions.

Depth of genre knowledge has been found to facilitate children's writing performance (Graham, McKeown, Kiuhara, & Harris, 2012; Olinghouse & Graham, 2009). Students in Study 1 and 2 applied a wide range of translation strategies, many overlapping across genre. This finding may suggest the need to teach children, especially those who struggle with writing, the

requisite genre knowledge needed to produce well-written, task-appropriate texts. This knowledge gives children the means to know what kind of message must be conveyed (purpose) and to meet the expectations of the reader (audience) (Epstein-Jannai, 2005).

At the same time, there is increasing recognition that a simple distinction between narrative and expository writing may not adequately account for translation at the discourse level, which may also be diverse given the generativity of the translation process. The wide variety in applied translational categories across genre seems also to indicate that these various kinds of translation strategies may not necessarily be limited to one particular genre. Rather, depending on purpose and task demand, children will write sentences which employ translation strategies that have a wide variety of application across different genre.

Furthermore, for students with severe transcription problems, the challenge of just translating thoughts into written language can be a daunting task and learning strategies that focus on translation at the sentence level may encourage them to try because they are more likely to succeed than to focus on the more challenging task of translation thoughts into a larger discourse unit such as the genre at the text level. Many students with SLDs affecting transcription also have co-occurring attention problems including ADHD. That may account for the often observed irrelevant comments. Moreover, examination of individual student profiles showed that many of the students in upper elementary and middle school did not know how to take notes based on read or heard source material, to use for a writing task that requires integration of two language modes—reading-writing or listening-writing—in order to write a summary of the source material. Such a writing task does not depend on genre-specific writing for narrative or expository per se but has ecological validity for the kinds of writing assignments needed at school to write assignments in the classroom at school and at home out of school. Self-

regulated writing instruction might focus on note taking, finding the main idea and supporting details, and creating schema for single or multiple source materials to write summaries.

Was there Evidence that Teaching Translation Strategies Improved Sentence Composing?

As reported in the prior chapter, the performance of Study 2 children on *WIAT-II Sentence Combining* (Pearson, 2009) changed slightly more than 1/3 *SD*, which was a statistically significant difference from pretest to posttest. Thus, after being taught a set of strategies that may be applied to translate thoughts into written language, students were significantly better able to combine two sentences into one sentence that still expressed all the ideas in the original two sentences. That is, their ability to translate ideas in two separate sentences into a single sentence had improved. Saddler and Graham (2009) found similar improved sentence combining skill for fourth graders after explicit instruction in constructing sentences. It is possible that the WIAT-II Sentence Combining task may be sensitive to the teaching of translation strategies to developing writers with SLDs.

CHAPTER 8: THEORETICAL AND EDUCATIONAL SIGNIFICANCE OF STUDY 1 AND STUDY 2, LIMITATIONS, AND FUTURE DIRECTIONS

Theoretical Significance

This dissertation research extends earlier research of the author that showed that individually administered measures used in schools to assess verbal reasoning are really assessing translation of cognitions into oral language (Niedo, Abbott, & Berninger, 2014). Although verbal reasoning has been shown to predict academic achievement on normed tests, considerably more variance is explained by adding to the verbal reasoning measure, scores on measures of components of a verbal working memory architecture, which serves as a language learning mechanism. Beta weights from regressions that predicted reading and writing achievement in the same sample of typically developing readers and writers used in Study 1 were used to weight the contribution of each verbal working memory component. Combining the measure of translation of thought into oral language with the beta weights for each component of the verbal working memory architecture predicted reading and writing achievement better than an approach often used in schools that subtracts reading or writing achievement from full scale IQ.

Study 1 identified translation categories that typically developing writers used in writing the next sentence and in writing the evolving discourse; and Study 2 taught that coding scheme as strategies for writing the next sentence to students with SLDs impairing their transcription skills. Three kinds of evidence suggest that translation of thought into written language can be taught: (a) observed use of the taught strategies in the writing of students who completed the 18 computerized lessons in composing, (b) observed review of the taught strategies while composing, and (c) significant change from pretest to posttest on a normed measure of learning to translate the same ideas originally in two sentences into a single sentence. As such, this

dissertation also extends research on speech acts performed by using oral language for communication purposes to research on *writing acts* performed by applying translation strategies for writing the next sentence and the evolving discourse to communicate one's ideas.

Educational Significance

This research is an example of translation science, which is translating research into educational practice. In Study 1, the dissertation author adopted the voice of researcher who investigated the variety of translation strategies for composing at two levels (next sentence and evolving discourse) that typically developing writers use. In Study 2, the dissertation author adopted the voice of teacher who investigated profiles of individual students to evaluate which of the taught translation strategies individual students used in their own writing. One implication relevant to translational science is that, although there are many ways in which cognitions can be translated into written language and individual students differ in which of these they use, students may benefit from teachers providing explicit instruction in what the possible translation strategies might be.

Limitations

A key issue to keep in mind in applying the results in educational practice, however, is that all composing was done with computer tools—writing with a stylus or a keyboard on an iPad. Results might have been very different if only pen and paper had been used.

A key limitation of computerized interventions, especially for developing students who have SLDs and often attentional difficulties, may be the relative inability of the computer, compared to a human teacher, to provide explicit guidance, that is, scaffolding, regarding which translation strategy to apply for specific writing goals for a writing assignment at hand. As Paris, Lipson, and Wixson (1983) pointed out, strategic behavior implies purpose and intentionality on

the part of the learner, suggesting intentionality and purpose on the part of the learner who chooses one alternative over another. According to the authors, strategy instruction, to foster independent and effective use by students, must have as its key components, the teaching of declarative (knowing when a problem exists and the requisite skills that might be called upon), procedural (knowing how to apply the strategy), and conditional (knowing when and why a strategy should be applied) knowledge. While the computerized intervention may have taught children strategies to write the next sentence, whether or not they appropriately applied a translation strategy depended on many factors. For example, the prevalence of irrelevant statements (comprising over 18% of total codes) across written summaries shows that children may not always apply taught strategies effectively and appropriately.

Children with specific learning disabilities may benefit from receiving the immediate, targeted feedback of a responsive human teacher during the process of applying the translation strategies one sentence at a time. In a previous study involving a computerized program for children who struggled with silent reading fluency (Niedo, Lee, Breznitz, Berninger, 2014), the dissertation author and a collaborating teacher/ author found that children needed constant guidance and feedback from the room teachers to facilitate their learning from the program. For example, many did not pay attention reliably to the written language on the computer screen until the first two authors designed and implemented strategies for paying attention to the computerized learning activities. Some students with SLDs have no problem attending and engaging when computer activities involve eye hand coordination or games that are not language-based. In contrast, many students with SLDs have a great deal of difficulty in paying attention to oral language—especially instructional talk-and written language.

Future Research Directions

As the Common Core State Standards shift the focus of school improvement efforts towards college readiness for children and youth, renewed attention will be directed towards skilled writing for all students, including those with disabilities (Graham & Harris, 2013). College readiness entails writing from source material, an essential component of skilled academic writing. Although students are routinely given written assignments that require report writing, often they are given no instruction on taking notes from source material they read, integrating notes from multiple sources, and writing summaries of what they read without copying the source material verbatim. Likewise, as they move up the grades, increasingly, they are expected to listen to lectures and take notes but are seldom taught how to take notes and use them for various purposes. Another interesting direction for future research may be to investigate the extent to which note-taking from the source material facilitates or hinders summary writing. The computerized intervention in this study required children to write notes from both the heard and read information source. An initial survey of the data showed that 15.4% of summaries from the read source were inaccurate statements of information, while the number was 12.4% inaccurate statements for the heard source. For children who struggle with writing, further research may inform whether their writing benefits from the mode of presenting the source material.

For the first cohort in Study 2 there were not sufficient numbers of typically developing writers to include a control group for comparison. Once the second and third cohort's data are available, there will be a control group sufficiently large enough to do so. Of interest might be to investigate the differences in types of translation strategies applied by typical and disabled writers within a given genre after the translation strategies are taught. In addition, extending the

current research to include measures of writing quality might be used to determine if explicit teaching of strategies for writing the next sentence facilitates quality of writing for both groups of students, especially at the level of evolving discourse.

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Examples from children's writing to illustrate each of the coded translation strategies in the Study 1 (typically developing writers) and Study 2 (students with and without specific learning disabilities) that follows.

APPENDIX 1: STUDY 1 CODING SCHEME AND EXAMPLES

I. Coding Thinking about Writing the Next Sentence

A. Add Information

IA1. State fact or facts for which there is general agreement.
Narrative: The dog was a great Dane named Tiny.
Essay: Robts have a lot of tenolagy inthem.

IA2. State an opinion (belief).
Narrative: It was reeeeeeeeaaaaaaaaaaaaly funny.
Essay: playing on the computer is the funniest

IA3. Describe--paint a picture with words.
Narrative: Its face was made of mashed potatos and it's eyes were of chocolate pudding
Essay: A computer is a machine that has a screen

IA4. Describe a state of mind or feelings
Narrative: When I finally got in the hang of things I was filled with joy!

IA5. Describe a function or use of an object.
Essay: A computer is something that people use to write letters or emails.

IA6. Describe observable behavior.
Narrative: It jumped down and went away as I started to get up.

IA7. Tell the next step or procedure.
Essay: so if anyone calls you while you're on the internet, they will get the busy signal, and have to try to call again

IA8a. Tell next event.
Narrative: *Someone started a food fight.* He got detention for 10 days.

IA8b. Tell prior event.
Narrative: *Someone started a food fight. He got detention for 10 days. He wasn't allowed to talk in the school for those ten days.* The food fight lasted for an hour and 40 minutes.

IA9. Define what something is

Narrative: In french, conge means “day off”.

Essay: Email is an online postcard you can send to different people.

IA10. Define what something is not

Essay: *You can do a lot of things on a computer like panit [paint]*. Not pad (you can write on that)

IA11. Illustrate--give one or more examples or counter-examples.

Essay: On your computer you can also play games like pinball mindswipper, salter [solitary], chackers.

IA12. State a wish

Narrative: I hope that this year it snows again so that I can re-live the memory with my friends.

Essay: somtimes i wish i had a robost so it coud help me wth my home work

IA13. State a goal/plan.

Narrative: at the end of recess we were going to open it.

IA14. Tell a plan for reaching the goal.

IA15. Make a prediction.

Essay: Someday in the future, I think computers might be like a friend

IA16. State conditions If… then... (then may be implied not stated)

Essay: and if you pay a carten [certain] amot of mony ever month you can have the intrat [internet].

IA17. Pretend or imagine what could be but does not necessarily exist.

Narrative: An elephant sitting on a kangaroo flew into school on a blueprint for a U.F.O.!

Essay: A robot can entertain you with a po up t.v,

IA18. Make a comparison (analogy or metaphor)

Narrative: and then I knocked over every one in my line like dominos.

Essay: And e-mail is likesending letters to your friends on the computer.

IA19. State an outcome

Narrative: She flew us home, and that was the end of that.

IA20. Make a statement about time (when) and space (where)

Narrative: I woke up on a Sunday morning in December and my roof was white!

IB. Provide an explanation

Narrative: The surprising thing that happend was Spenser was not in my class.

Essay: The best part in using a computer is the internet because you can find games and information.

C. Modify Text

IC1. Qualify a prior statement—place limit(s) on it.

Narrative: *I was standing infront of my locker when I heard a strange noise.* It was coming from an empty class room.

Essay: *There are few actual robots in the real world I believe.* There are few of what you typically think of as a robot at least.

IC2. Evaluate content or organization of what you are writing

IC3. Repeat part of prior text with substitution.

Narrative: *It was surprising because I thought I wouldn't get that in the third grade.* That's the surprising thing.

IC4. Paraphrase prior text.

Essay: Robots are a type of machine. They are used for many different things. Some robots are toys and are used to entertain while others are used for different things like helping do everyday things. robots are made of meteal, and can often have similar features to humans. *They are useful and can be made and work in many different ways.*

D. Create Dialogue

ID1a. Direct dialogue among characters

Narrative: My brother's pet guinea pig started yelling, "I'm a rebel guinea squirell!" over and over agin.

ID1b. Indirect dialogue among characters.

Narrative: She said that my teacher was gone and she was the substitute.

ID2a. Pose question for reader audience.

Narrative: The end or is it?

Essay: *Then, robots would be a species.* Wouldn't that be cool?

ID2b. Make editorial comment for the reader audience.

Narrative: I bet that was a good way for him to start off his day.

Essay: You'll find that it [*computer*] is really fun.

ID2c. Issue direct or indirect command for reader audience

Narrative: I don't want you to laugh ok.
Essay: You should take lessons from someone like me on how to use a computer.

II Coding Connecting Sentences Together

A. Within Same Level

IIA1a. Tie sentences with a pronoun.
Narrative: *I was on my way to class when my friend Nigel slipped past me a fell into a garbage can.* I laughed and asked him was the rush?
Essay: *a cumputer is a machine that runs on battires/* it is like a imfermation gatherer

IIA1b. Connect sentences with a word in subordinate clause
Narrative: *It took about 50 minutes to install.* When it was done installing, my friend Dylan came over.
IIA1c. Connect sentences with a single word (e.g. *then* at beginning of independent clause or *after* in prepositional phrase)
Narrative: *i kind of thout it was power out* . then i saw how heavy the rain was
Essay: You can also watch movies on it[*computer*].
IIA1d. Phrase that repeats or constructs prior proposition or content
Essay: *A robot could be made out of almost anything.* Metal is the main thing people like to make robots out of.
IIA2. Make a comment that interrupts the idea in progress and then continues with that idea unless at end because time runs out.
Essay: *The robot could be nice and try to serve them, but they might think a drink would be poison. They might think that food would have injected poison.* A robot could be made out of almost anything. Metal is the main thing people like to make robots out of…

B. Across Levels

IIB1a. Narrative Genre Organization: Characters
IIB1b. Narrative Genre Organization: Setting (place and/or time)
IIB1c1. Narrative Genre Organization: Plot introduction or
IIB1c2. Narrative Genre Organization: Plot in progress
IIB1d. Narrative Genre Organization: Plot outcome
IIB1e. Narrative Genre Organization: Ending statement

I was in bed at about ten o'clock when I woke up.	IA20; IIB1b, IIB1c1
I heard a noise that sounded like my cat.	IA6; IIB1c2
I started to look down over my bunkbed but couldn't see anything.	IA8a; IIB1c2
I lied back down when suddenly a cat (not mine) jumped up onto my bunkbed and hissed at me.	IA8a; IIB1c2
I remembered that we had been leaving the back door open so our cats could do there business outside.	IA8a; IIB1c2
That must have been how it got in.	IB; IIA1a

It jumped down and went away as I started to get up. IA8a; IIA1a; IIB1e
It was reeeeeeeeaaaaaaaaaaaaaly funny. IA2; IIA1a
THIS IS A TRUE STORY! ID2b; IIA1a, IIB1e

IIB2a. Expository Genre Organization: Topic sentence for paragraph
IIB2b. Expository Genre Organization: Provide information
IIB2c. Expository Genre Organization: Compare and contrast
Robots have different feet. Some robots haven't.
IIB2d. Expository Genre Organization: Take position and defend (persuasive)
IIB2e. Expository Genre Organization: Summary so far
IIB2f. Expository Genre Organization: Conclusion
IIB2g. Expository Genre Organization: Ending statement

Computers come in many shapes and sizes. IA3; IIB2a
They are usually they are shaped like boxes, but some computers
are flat screeened. IA3, IA11; IIA1a IIB2b
The screen is black when the computer is not being used. IA3; IIB2b
The outside of the computer is probably grey or black. IA3; IIB2b
On the computer you can do many things. IA5; IIA2; IIB2a
You can write with the keyboard. IA5; IIB2b
You can also make graphs and charts. IA5; IIB2b
Finally, computers are used a lot for math. IA5; IIA1c, IIB2g

APPENDIX 2: STUDY 2 TRANSLATION CATEGORIES TAUGHT IN

COMPUTERIZED LESSONS AND EXAMPLES

I. Coding Thinking about Writing the Next Sentence

A. Add Information

IA1. State fact or facts for which there is general agreement.

Autobiographical: When I started school in 1st grade my teacher was Mrs. T_.

Summary: Japans histroy dates back to prehistric times, and was known as the land of the rising sun.

IA2.State an opinion (belief).

Autobiographical: day care was the funniest thing ever

Summary: Japan is a country with lots of important and interesting information!

IA3. Describe--paint a picture with words.

Autobiographical: in my house theres a chico cage a up stares[*upstairs*] and down stares[*downstairs*] a drive way that has never den[*been*] ust[*used*] with a gras[*grass*] that is my room a grapvine and tomato plants.

IA4. Describe a state of mind or feelings

Autobiographical: I was unowan[*annoyed*] That I had to go To such a plaic[*place*]

IA5. Describe a function or use of an object.

Summary: Zero represents No Number in that place where a Number would be

IA6. Describe observable behavior.

Autobiographical: One time we got an old chair and were dunking on his basketball hoop

Summary: Europeans took people from their homes they live in for thousands fo years

IA7. Tell the next step or procedure.

Summary: *Number lines: How you would make a number line is to draw a line and draw more lines going up and draw a number.* and thn you write a number in between the number lines and then find the anser.

IA8. Tell next event.

Autobiographical: *I slepet in until about Half way through 3rd period when my mom woke up and said that it was time to get ready for school*
So I got ready for school…
Then I packed my lunch and lef the House for scool.

Summary: *first the Spanish came & a priest Hildag led a movement in 1810 for Mexico to have there independance.* He was killed, but Mexico got there independance.

IA9. Define what something is
Summary: Reefs are low lying stretches of sand coral, close or under the water.

IA10. Define what something is not
None observed

IA11. Illustrate--give one or more examples or counter-examples.
Autobiographical: 2nd grade was my first experience with real work, like having to do your first test and projects.
Summary: *some islands are diffret from others*
like some islads are alone and some have lots of islands together called arcapalego like australia.

IA12. State a wish
Autobiographical: I want to go to the Unifersity of Washington and become a designer for a shoe company or become a artist.

IA13. State a goal/plan.
Autobiographical: I am going to a bmx camp this summer.

IA14. Tell a plan for reaching the goal.
Autobiographical: I am going to be training with my coach an some other player's to.

IA15. Make a prediction.
Autobiographical: *And more to come in the years, the day we get out of school, I think June 14, we are leaving to go to the Domincan Republic.* I bet we are going to have a blast.

IA16. State conditions If… then... (then may be implied not stated)
Autobiographical: if we don't take notes than you fail the class
Summary: if we did not have zero there wouldent be a number line…

IA17. Pretend or imagine what could be but does not necessarily exist.
Autobiographical: In my contree there would be no wure/ it would Be a Peaseful pace and ther Would be a nice place for People to live

<u>IB. Provide an explanation</u>

Autobiographical: I like it because we all have our own rooms and I have the biggest out of all the kids.

Summary: It used to have a nother name "the islnd of thieves" given to it by th esoanirds[*Spaniards*] after a missunder standing in 1521 after a the chamorrs not understading the consept of private portly[*property*] took a boat from the spardurdes[*Spaniards*].

C. Modify Text

IC1. Qualify a prior statement—place limit(s) on it.

Autobiographical: *Amarica is cool but My wold is a lot smaler.* I meen it is realy small like realy small

Summary: *[Babies]are able to differentiate between numbers such as one and two and count them to their abilities.* But they still haven't mastered it.

IC2. Evaluate content or organization of what you are writing

Autobiographical: *I have a zoo at my house… I have 1 dog, 4 cts, 4 fihs, 2 frogs, and 2 Hamsters!!!* That shows that I love pets!

Summary: *The Philipines have a right to be proud of their islands, the oldest man ever alive existed there 67000 years ago.* (That doesn't seem right…)

IC3. Repeat part of prior text with substitution.

Autobiographical: I would be *free as a bird.* I would be *the majestic pinnacle of evolution…*Iwould be *courageous and clever in my every move…*

Summary: *Mexico has a very good history of it's ownership…* Mexico has a great history of how it came to be today.

IC4. Paraphrase prior text.

Autobiographical: *I like to Play minecraft which is a video game, that I like* a video game that I like is minecraft.

Summary: The journey math begins with counting all the way to very computationally- driven math problems,

D. Create Dialogue

ID1. Among Characters--Tell next comment in conversation (dialogue).

Autobiographical: "Sorry" said my om but that was not good enough

ID2. Pose question for reader audience.

Autobiographical: I mwan[*mean*] have you ever thought about how lucky you were to have this beautiful world unstead of just wanting more?

Summary: did you know that there are 20,000 to 30,000 islands in the pacific ocean

ID3. Make editorial comment for the reader audience.

Autobiographical: So, there you go, I hope my boreing afterschool life summary didn't bore you to death!

Summary: *….Japans population and Japan contane 1/10 of wrolds pop.* That's one crowded iland.

ID4. Issue direct or indirect command for reader audience

Autobiographical: Be your own man, choose carefully, and be your own god. See what you can do with that.

Summary: *I mwan have you ever thought about how lucky you were to have this beautiful world unstead of just wanting more?* Think and Discuss!

II Coding Connecting Sentences Together

A. Within Same Level

IIA1. Tie the other sentences together with a connecting word and/ or sentence.

IIA2. Make a comment that interrupts the idea in progress and then continues with that idea unless at end because time runs out.

B. Across Levels

IIB1. State a topic sentence for the sentences that follow.

IIB2. Summarize main ideas or points so far.

IIB3. Draw conclusion.

IIB4. State outcome of a sequence.

IIB5. Compare - how same and/or how different.

IIB6. Make an ending statement for text

Autobiographical:

out side of school i like DOCTOR WHO because his mortal enimy are these robots	IA4, IB; IIB1
actuly robots is the wrong term	IC2; IIA1
they are called DALEKS and are geneticly enginered.	IA1, IC1; IIA1
they were made by this creep davoros	IA1; IIA1
daleks have no legs and to replace the legs they have a sort of cone with a lot of bumps on it	IA3
i like to watch doctor who because i like aliens.	IA4, IB
i also like monty pithon	IA4, IIA1; IIA2
my favoret part is the BLACK KNIGHT because he is halarious.	IA4, IB
he gets his arm cut off and king auther says, i have betten you worthy opponent the black knight says, it is mearly a scratch.	IA6, ID1; IIA1
the king yells A SCRATCH, your whole arm gone!	ID1
the kni	[*did not complete; timed out*]

Summary:

Math is a journey.	IA1 (quoted from prompt); IIB1
Starting with counting on a number line to real-world shapes.	IA11; IIA1
Also reading clocks, that include finding minutes to hours.	IA11; IIA1
Also it goes to patterns with usally more than two digets.	IA11; IIA1
Also doing computatienal math problems.	IA11; IIA1
The journey math begins with counting all the way to very computationally-driven math problems,	IC4; IIB2
it's a long, fun and endless journey that anyone can do.	IA2; IIA1, IIB6

Additional Coding

Did child copy verbatim, in part or whole, text from the prompt?
Did child copy the sentence from text prompt with change(s) in word(s)?
Did the child copy the sentence from text prompt with change(s) in syntax?
Did the child copy the sentence organization of text prompt (i.e. write information in the same order they were presented in the prompt)?
Was a main idea stated accurately? Yes or No
How many accurate factual details were included from source?
How many irrelevant statements (e.g. personal remarks or factual background knowledge) were included?