Differences in the early writing development of struggling children who beat the odds and those who did not.

Sinéad J. Harmey and Emily M. Rodgers,

The Ohio State University

Department of Teaching and Learning, The Ohio State University. Sinéad Harmey is now at Department of Elementary and Early Childhood Education, Queens College of the City University of New York.

Correspondence concerning this article should be addressed to Sinéad Harmey, Department of Elementary and Early Childhood Education, Queens College, Flushing, NY 11367.

Email: sinead.harmey@qc.cuny.edu

Abstract

We used mixed methods to examine differences in the early writing development of children, identified as at risk of literacy difficulties, in the context of Reading Recovery (RR). From an extant dataset of 24 children, we identified those who made fast progress (n = 6) and those who did not (n = 8). We studied change over time in the sources of information they used and problem-solving actions they took over the course of the intervention. We developed a writing rubric to analyze videos of writing interactions (280 min) and written messages (N = 674). Results demonstrated that the fast progress had higher end of intervention ratings for multiple dimensions of writing. HLM analysis showed that the fast progress group had higher rates of growth in their use of sources of information (spelling and letter-sound relationships) and observable problem-solving behaviors. Fast and slow progress groups did not differ in what they wrote but, for both groups, dips in legibility coincided with increased linguistic complexity. By juxtaposing descriptions of writing development for both groups, results provide useful information for instruction and intervention.

Learning to write is a critical component of becoming literate (cf. Clay, 2001; Fitzgerald & Shanahan, 2000), and the development of strong writing skills plays an important role in enhancing later reading development (Graham & Hebert, 2012; Graham et al., 2012). Given its importance, it is somewhat surprising that we know so little, comparatively speaking, about how early writing development proceeds. Indeed, descriptions of literacy development are much more coherent and diverse in terms of early and skilled reading development than early and skilled writing development (Beard, Myhill, Riley, & Nystrand, 2009).

There is, according to Tolchinsky (2016), a critical gap in extant research about early writing development that occurs during the period when children learn to put words into sentences and when they produce cohesive texts, or move into conventional literacy (typically the first two years of formal schooling). In terms of schooling, McNaughton (2011a) described this period as critical because children, who are working hard to learn how to read and write, are at risk of experiencing difficulties that can affect progress in the long term (p. 3).

It is reasonable to expect, therefore, that if we could better describe the writing development of young children identified as at risk of later literacy difficulties during the first years of formal schooling, and the differences between those who beat the odds by catching up with their peers and those who do not, that we could use that awareness to optimize learning and instruction for writing (Beard et al., 2009). It also seems reasonable to expect, because of the reciprocal nature that appears to exist between early writing and reading development that improving writing instruction will also have a positive impact on reading development.

The purpose of this study, therefore, is to describe the differences in the early writing development of children, identified as at risk of later literacy difficulties. Specifically, we analyze differences between two groups of children, both of whom started first grade at very low

levels of literacy achievement and were selected for Reading Recovery (RR) (Clay, 2005), but who either (a) beat the odds by making fast progress and catching up with their peers by the end of the 20-week intervention, or (b) made slow progress, did not respond well to the intervention and remained far behind their peers in terms of literacy learning. Like McGee, Kim, Nelson, and Fried (2015) who studied change in reading, we describe observed changes in what young writers learn to do and the sources of information that they learn to use while writing a short message with a teacher's help. Findings about the quantitative and qualitative differences between the two groups of children, both identified as at risk of later literacy difficulties, in the context of an early literacy intervention, will lend to our understanding about writing development at a critical period.

Promoting Early Writing Development to Beat the Odds of Literacy Failure

Once children fall behind in literacy, they are unlikely to catch up; early failure means continued failure for most young children (Juel, 1988). The critical need to intervene early has been well established to change predictions of failure that come with early literacy difficulties (Vellutino et al., 1996).

Knowing more about how writing proceeds and how change differs for children identified as at risk of later literacy difficulties is important because the writing process, and the component skills involved in writing, appear to play a central role in the prevention of later literacy difficulties. Teaching the writing process and increasing the amount of writing that children do can improve children's reading comprehension (Graham & Hebert, 2012). Indeed, Graham and Hebert found that spelling instruction can improve both word reading and reading fluency, and teaching sentence construction can improve oral reading fluency. Moreover, invented spelling has been shown to promote phonological and orthographic knowledge and

facilitate later reading development (Ouellette & Sénéchal, 2008, p. 899; 2017). It has even been documented that the development of fine motor skills involved in writing is causally linked to decoding skills development (Suggate, Pufke, & Stoeger, 2016).

Characterizing Early Writing Development

Models of early writing development that provide metaphors about how writing develops are scant and certainly less well developed than those about reading (Puranik & Lonigan, 2014); nevertheless, existing models are useful in that they identify predictors of later literacy achievement. Wagner et al.'s (2011) model of early writing development identified five factors that explained differences in student growth, including handwriting fluency, message complexity (t-units and syntactic density), and macro-organization variables, as well as (but to a lesser extent) spelling and punctuation. Other models (cf. Hayes & Berninger, 2009; Juel, Griffith, & Gough, 1985) focus on identifying the component skills of writing and empirical studies framed by these models tend to use cross-sectional designs to explicate the relationship between factors like name writing (Bloodgood, 1999; Both-de Vries & Bus, 2008; Cabell, Justice, Zucker, & McGinty, 2009; Haney, 2002) or letter writing (Puranik, Lonigan, & Kim, 2011) involved in early writing development. Studies such as these are important in that they help to identify the factors that are related to literacy success but they do not tell us what develops nor how these factors change over the course of development, information useful to inform instruction.

Learning to write involves the orchestration of knowledge about letters, letter-sound associations, orthography, words, concepts about print, sentence, and text structure while simultaneously demanding control of working memory, self-regulation, monitoring of the accuracy of the written message (MacArthur & Graham, 2016). It is dependent on fine motor skills and transcription fluency (McCutchen, 1996). Similarly, Clay (2001) suggested that

"within the directional constraints of print" (p. 1) young readers and writers learn to draw on multiple sources of information as they problem-solve the task of reading or composing text. These sources of information could include oral language, letter-sound associations, letter shapes, orthography, grammatical knowledge, and semantics.

Moreover, it has been posited that children must learn to take problem-solving actions when they encounter difficulty while writing (Clay, 2001). These problem-solving actions include searching for more information, monitoring, and cross-checking sources of information, and can be inferred by observable behaviors like rereading, pausing, and self-correction (Boocock, McNaughton, & Parr, 1998). The development of these problem-solving actions has been characterized as change from simple to complex over time, but proceeding along different paths of development for each child (Clay, 2001). As such, an examination of writing development requires attention both to what children write and how they write it.

Measuring Early Writing Development

Several researchers have used Siegler's (1996) overlapping wave perspective to describe how changes occur in components of the writing process (Jones, 1998; Rittle-Johnson & Siegler, 1999; Sharp, Sinatra, & Reynolds, 2008; Yaden & Tardibueno, 2004). Taken together, the findings from these studies demonstrate that writing development can be described as proceeding in overlapping waves and not in a uniform manner across subjects. There are three assumptions about development from an overlapping waves perspective: (1) Children approach tasks in a variety of ways, (2) these ways of thinking or approaches compete with one another until they reach a point of stability, and (3) development involves gradual change over time (Chen & Siegler, 2000). Thus, from this viewpoint, knowing more about the path, rate, and variability of change is important.

The Present Study

A gap in the research, and one that we intend to address in this paper, is that researchers have tended to focus on identifying specific factors regarding early written products (such as spelling or concept of word) that predict later literacy success rather than attending to a broad spectrum of early writing behaviors in addition to children's written messages. In addition, few researchers have tried to explicate the differences in changes in writing behaviors when development accelerates or goes awry during the critical period when children emerge into conventional literacy. Our paper attempts to address these gaps in that we study change over time in what children write and how they wrote it, for children making fast progress and for those whose progress appears to have gone awry in the context of a writing intervention. The results hold the potential to provide valuable information for those who work with children at risk of later literacy difficulties.

Study Purpose and Research Questions

The purpose of this study was to describe differences in the writing development of children's (1) use of sources of information (oral language, letter/sound relationships, spelling, and use of directional rules) (2) strategic activities inferred by observable writing behaviors (monitoring, searching, self-correction, and fluency) and (3) written messages (linguistic complexity and legibility). In particular, we sought to describe how change differed for children classified as making fast or slow progress in written production in the context of an early literacy intervention. The questions that guided our inquiry were:

1. How do the sources of information that children use as they write with a teacher change over time and how does this change differ for children who made fast or slow progress in the context of an early literacy intervention?

2. How do the strategic activities, inferred from children's observable revision behaviors as they write with a teacher, change over time and how does this change differ for children who make fast or slow progress in the context of an early literacy intervention?
3. How does the linguistic complexity and legibility of children's written messages change over time and how does this change differ for children who made fast or slow progress in the context of an early literacy intervention?

Context for the Study: Reading Recovery Lessons

At the beginning of first grade, the children in this study were identified as the lowest achieving by their schools in terms of their literacy achievement on the Observation Survey of Early Literacy Achievement (OSELA) (Clay, 2013) and thus, as at risk of later literacy difficulties. They were subsequently provided with a short-term early literacy intervention, RR (Clay, 2005). RR is a one-to-one daily intervention that occurs over a period of no more than 20 weeks. The efficacy of RR has been demonstrated in a multi-site randomized controlled study by May et al. (2015) who determined that effect of RR on treatment students was .47 relative to a national sample of their first-grade peers on a standard measure of reading ability. For this reason, we thought the context appropriate, as we could reasonably expect to see accelerated changes for some students and little change for others over a short period.

The daily lesson involves reading, letter and word work, and a writing component. We focused solely on the writing component, typically lasting about 10 min each lesson. While Clay (2001) described writing as important in terms of its contribution to learning to read, she also stated it was important in its own right (p. 18) and is, thus, an essential component in the RR lesson, conducted not just to serve reading. During this part of the lesson, the student composes and writes a short message of about one to two sentences with teacher support (Clay, 2005). The

message may be about any topic: the book that was just read in the lesson, something exciting that happened to the student, or a topic that interests the child (cf. DeFord, 1994). It is expected that children will learn how to compose and construct messages, form letters, learn to attend to directionality of print, and develop phonemic and orthographic awareness.

Clay and Cazden (1990) described the teacher's role in this part of the lesson as making deliberate teaching decisions to increase the child's accessibility to the task of writing a simple message, offering more or less help as needed to compose and record the message. Clay (2005) noted that, in RR lessons, the "child learns to bring together …the ideas, the message (which must be his own), the search for ways to record it, the monitoring of the message production, and the reading of what he has recorded" (p. 52).

The setting therefore was suitable for our study as all the teachers used similar instructional techniques to support writing and message intent was free to vary and not controlled by the teacher. Such a setting is more likely to reflect actual writing development than when children are writing controlled tasks (Dyson, 1983). Finally, given the documented evidence of student responsiveness to the intervention, it was reasonable to expect that some children would make accelerated progress from low levels of achievement while others would not, thereby providing us with a useful context to study variability in the early writing development of children identified as at risk of later literacy difficulties.

Method

We used mixed methods to address questions about how learning changes over time. For Research Question 3 we used a microgenetic design. This design is used to understand the mechanisms of change (Flynn, Pine, & Lewis, 2006) and to reveal how children come to know rather than "what they know" (Granott & Parziale, 2002, p.12). Consequently, the method

requires a high density of observations, repeated frequently over a period of rapid change, that are analyzed intensely (Siegler, 2006). The method is resource intensive which results in lower numbers of participants. An affordance of the method, however, is a picture of development at individual level that is detailed as opposed to just snapshots of development.

We used an extant dataset that contained records for 24 students. This dataset contained 1,050 written messages and 48 videos (totaling 450 min of instruction) taken at several points during the intervention. The dataset comprised data for 24 students who attended 22 schools in a large urban city in a midwestern state of the United States. In 23 of the 24 schools over 80% of the school population were considered economically disadvantaged. Seventeen of the schools did not meet the state's quality indicator of having 80% of children scoring proficient or above in in reading and math (Harmey, 2015). The schools were ethnically diverse.

Participants

Students. We used Writing Vocabulary (WV), a task of the Observation Survey of Early Literacy Achievement (OSELA) (Clay, 2013) to identify students in the two groups. First, we selected all children whose Fall WV score would put them at or below the 20th percentile compared to a random sample of their peers at the beginning of first grade (n = 14). The remaining 10 students started the program above the 20th percentile and, thus, were not considered for inclusion in the study.

To form the groups, we selected children whose WV score at the end of first grade on the OSELA was at or above the 30th percentile (n = 6) as those who made fast progress and those whose exit WV remained below the 20th percentile (n = 8) as slow-progress students (see Table 1). There were three boys and three girls in the high-progress group, only one of whom spoke

English as an additional language. There were five boys and three girls in the low-progress group, only one of whom spoke English as an additional language.

Table 1.

Slow (n = 8) and Fast (n = 6)) Progress Groups' Demographics, Pre-/ Post-Intervention and Difference between Writing Vocabulary Scores*

			Pre-intervention		Post-intervention		Difference	
	Race/ Ethnicity	Language Spoken at Home	Raw Score	%ile	Raw Score	%ile	Raw Score	%ile
Slow Progress								
Josh	Black	English	4	5	29	18	+25	+13
Katie	Black	English	8	16	29	18	+21	+2
Hailey	Black	English	7	13	25	12	+18	-1
Ethan	Black	English	4	5	26	13	+22	+8
Tyler	Black	English	5	8	23	9	+18	+1
Gabriel	White	English	5	8	22	8	+17	0
Maria	Hispanic	Spanish	9	20	22	8	+13	-12
Robert	Black	English	9	20	21	7	+12	-13
		Group Average	**6.38**	**11.88**	**24.63**	**11.63**	**18.25**	**-.25**
Fast Progress								
Paul	Hispanic	Spanish	4	5	49	69	+45	+64
Courtney	White	English	2	2	46	65	+44	+63
Jake	Black	English	2	2	37	38	+35	+36
Daniel	White	English	2	2	36	35	+34	+33
Emma	Black	English	4	5	35	33	+31	+28
Courtney	White	English	7	13	36	35	+29	+22
		Group Average	**3.5**	**4.83**	**39.83**	**45.83**	**36.33**	**41.17**

*Raw score is the number of words written in 10 min.

The fast progress group's mean pre-intervention WV score was 3.5 (*SD* = 1.97), placing them, on average, at the 5th percentile. Their post-intervention mean WV score was 39.83 (*SD* = 6.05), placing them, on average, at the 45th percentile. The slow progress group's mean pre-intervention WV score was 6.38 (*SD* = 2.13), placing them, on average at or below the 11th percentile. Their post-intervention mean WV score was 24.63 (*SD* = 3.16), placing them, on average, at the 12th percentile at the end of the intervention. It could be suggested that this low-progress group made typical progress, as their percentile rank remained relatively the same. We argue that, given that the children were receiving daily, intensive instruction, this progress is slow as one should expect the children to make fast progress and to catch up with their peers.

An independent t-test demonstrated a significant difference between the fast (*M* = 3.5, *SD* = 1.97) and slow progress groups' (*M* = 6.38, *SD* = 2.13) means at the beginning of the intervention, $t_{(12)} = 2.57$, $p < .05$. It is worth noting, however, that it was the group that made fast progress whose means scores were initially lower than the group that made slow progress. By the end of the intervention, there was a statistically significant difference between the fast (*M* = 39.83, *SD* = 6.05) and slow progress groups' (*M* = 24.63, *SD* = 3.16) mean WV scores, $t_{(12)} = 6.14$, $p < .0001$, $d = 3.15$. The difference in means, on this occasion, was in favor of the fast-progress group.

Teachers. The 14 students were taught by 12 teachers who were in the initial professional-development year to become RR teachers. Two children in the slow-progress group (Josh and Robert) were taught by the same teacher. Although the teachers were new to the RR intervention, all were at least mid-career elementary school teachers with an average of 15 years' teaching experience between them. They were all female; three were Black and nine were White.

Sources of data. Sources of data included videos and writing samples of the writing component of the RR lesson for the children in our study. The videos were taken at Week 5 (first observation) and the last week (final observation) of the intervention, and totaled 28 videos, or approximately 280 min of writing instruction. All videos were checked for fidelity to the RR framework by the first author, who had expertise in RR. Each written message for the 14 students was analyzed for this study (N = 674 messages). As described earlier, teachers are expected to include a writing component in each student's daily lesson. The teacher helps the student compose a short message of 1-2 sentences on one sheet of paper, while another sheet serves as a practice page where the teacher can teach the student strategies for spelling unfamiliar words (using phonemic awareness, orthographic awareness, rimes, morphemes, or sight words).

Measures

In order to address our research questions, we used Clay's (2013) OSELA to select students and a researcher-designed rubric to analyze the videos and writing documents.

An Observation Survey of Early Literacy Achievement

The OSELA (Clay, 2013) has six tasks that include word reading, text reading, word writing, phonological encoding, and conceptual awareness about print. In the United States, a total score is available which has been found to provide an effective means of screening for later literacy difficulties (D'Agostino, Rodgers, & Mauck, 2017). The National Center for Response to Intervention [NCRTI] (2010) reviewed the OSELA and stated that there was convincing evidence in terms of the reliability, validity, and classification accuracy of the assessment. The NCRTI also stated that the assessment had broad generalizability. In fact, of all the screening assessments reviewed by the NCRTI, the OSELA was rated highly across five categories,

namely classification accuracy, generalizability, reliability, validity and disaggregated reliability, validity, and classification for diverse populations.

In our study, we used two of the writing tasks from the OSELA. We used Hearing and Recording Sounds in Words (HRSW) and WV to establish the validity of our rubric. We used the WV task to identify our groups. For the WV task the child is provided with a blank page and asked to write as many words as possible in 10 min. Each correctly spelled word receives one point. In the HRSW task, one of five alternate forms of a sentence is read aloud and the child is asked to write the sentence. Each phoneme correctly recorded accurately receives a score with a maximum score of 37. The OSELA (Clay, 2013) is used in many countries and estimates of reliability and validity from various studies have been provided. The test-retest reliability estimates for WV range between .62 and .97. The inter-rater reliability estimate for WV is .93 (p. 168). The test-retest reliability of HRSW ranges between .64 - .94 with alpha coefficients ranging between .92 and .96.

The Early Writing Observational Rubric

The Early Writing Observational Rubric (EWOR) comprised two parts: (a) ratings to judge the student's writing behaviors during the composition and writing of the message and (b) written message ratings to judge the legibility and complexity of the finished message.

Writing Behaviors. In line with Clay's (2001) literacy processing theory, the observational element of the EWOR is divided into two sub-sections; (i) Using and (ii) Doing. *Using* refers to the sources of information or knowledge used to write continuous text. *Doing* refers to the child's observed behaviors that implied strategic processing or problem-solving actions. Using the rubric, the rater is asked to observe the child's actions as they are observed to write and to consider how the child moves from not initiating a particular behavior to self-

initiating use of sources of knowledge or a problem-solving action in a fast and efficient manner. Items are rated on a scale of 0 (no observation of writing behavior) to 3 (observed independence in writing behavior) with a maximum possible score of 30 (see Figure 1). Essentially, along all items the rater considers if: (0) The teacher was observed to contribute all the information or assume responsibility for the action; (1) The child was observed to contribute this information with high support or demonstrated the behavior on at least one occasion; (2) The child mostly contributed this information with minimal help; or (3) The child consistently contributed the information or demonstrated the behavior with efficiency

Figure 1.

Early Writing Observational Rubric

	Observation of Writing					
	Item	**Score of 0**	**Score of 1**	**Score of 2**	**Score of 3**	Total
USING	Use of Language to Compose	Did not initiate/struggled to compose message without high support or was told what to write.	Slow to initiate composition of a simple message. Needed high support to construct message.	Exhibited control of parts of the conversation and composition. With support expanded message.	In control of the conversation/had a message ready to write. Composing was fluent and was flexible to make changes on the run.	
	Use of Orthographic Information	Did not demonstrate any awareness of orthographic features of words. Teacher contributed information.	Demonstrated some awareness of the orthographic features of words with prompting.	For many words, demonstrated some awareness of the orthographic features of words with minimal help.	Demonstrated awareness of the orthographic features of words and words were mostly spelled accurately and with efficiency	
	Use of Letter-sound Knowledge	Did not initiate slow articulation of words. Needed support to say word slowly, hear, and record sounds.	With prompting, could say word slowly and hear and record some initial sounds and dominant consonants with support.	Initiated slow articulation and heard and recorded phonemes in words from beginning to end with minimal support.	Initiated slow analysis of words independently and accurately (sometimes using vocalization to break a word apart or silently).	
	Use of Writing Vocabulary	Did not write any words independently.	Wrote one word independently. Process was slow. On all other occasions required support.	Wrote some words independently and with some speed with minimal support.	Wrote all words quickly, efficiently, and independently without support.	
	Use of Print Knowledge	Did not initiate placing spaces between words and needed constant direction.	Sometimes initiated making spaces between words but still needed support.	Spaced words correctly with minimal intervention.	Put spaces between words efficiently and needed no reminders to attend to this.	
		Did not initiate movement from left to right and needed constant support.	Sometimes showed control of directional movement but still needed support.	Moved left to right with minimal intervention but needed reminder to go to a new line when out of space.	Moved left to right quickly and efficiently. Moved to a new line when needed and needed no reminders.	
DOING	Rereading as if to seek help	Did not initiate rereading to seek help writing the next letter.	Rarely initiated rereading to seek help to write the next letter.	Sometimes initiated rereading to seek help to write the next letter.	Almost always initiated rereading to seek help to write the next letter.	
	Rereading for accuracy	Did not initiate any rereading to check the accuracy of what was written.	Rarely initiated rereading to check the accuracy of what was written.	Sometimes reread to check that the message was accurate with minimal support.	Almost always reread to check accuracy in a fast and efficient manner with no support.	
	Self-correcting	If errors were made did not notice or correct them.	If errors were made, noticed, and self-corrected on one occasion.	If errors were made, noticed, and self-corrected with some speed on most occasions.	When errors were made was fast to self-correct or wrote independently without error.	
	Fluency	Writing was slow and labored. Required high support to form letters or words.	Writing was generally slow but for known words or letters but pace picked up.	Writing was mostly fast and fluent but faltered over formation of some letters or words.	Writing was fast and fluent.	
						Total Score = ___ / 30

The items in the Using section of the EWOR include children's use of language to communicate a meaningful message (Harris, Fitzsimons, & McKenzie, 2004), use of letter-sound knowledge, use of orthographic information, concept of word, directionality, and number of words written independently. The Doing section has four items. The first item, "rereading as if to search for more information," refers to whether to whether the child relied on the teacher to tell the next word, used a word already written or read, or reread the sentence up to the point of the last written word or letter. Taken together, these observable behaviors could infer that the child was searching for more information (meaning, structure, or orthographic information) (Boocock et al., 1998) to write the message. The second item, "rereading as if to monitor for accuracy," refers to whether children reread the accuracy of what was already written. This observable behavior might suggest that the child was actively monitoring what he wrote, and cross-checking what was written down with what was intended (Chanqouy, 2009). The third item in this section is self-correction. For this item, the rater must consider whether the writer examines the text produced and corrects, or revises, the text written (Chanquoy, 2009, p. 80). The fourth and final item asks the rater to consider the fluency or speed at which the child wrote letters, words, and text.

Written Message. The written message element of the EWOR (drawing on Halliday & Hassan, 1976; MacKenzie, Scull, & Munsie, 2013; McCutchen, 2011; and Watanbe & Hall-Kenyon, 2011) was used to rate every written message produced within the RR lesson by both groups. Using the measure, the observer rated each item along a scale of 0 to 3. There were five items and the maximum raw score in the written message element of the rubric is 15 (see Figure 2).

Figure 2. Early Writing Observational Rubric (Written Message)

Written Message						
Construct	Description	Score of 0	Score of 1	Score of 2	Score of 3	Total
Legibility	Quality of Transcription*	Not legible. Uniformity of height, width, and spacing not apparent. Very large. Letters formed incorrectly.	Legible in parts. Some words uniform in height, width, and spacing although large. Some letters formed correctly.	Mostly legible. Height, width, and spacing between words mostly uniform. Not overly large. Letters mostly formed correctly.	Completely legible. Height, width, and spacing of words appropriate and not overly large. Letters formed correctly.	
Micro-levels of language	Linguistic Complexity*/**	Message could not be considered a complete or simple sentence.	Message is a simple short sentence.	One long sentence or two or more simple short sentences.	Two or more sentences. At least one is a long sentence.	
	Linguistic Texture ***	No use of cohesive ties.	At least 1 cohesive tie.	At least 2 cohesive ties.	3 or more cohesive ties.	
	Punctuation and Capital Letters ****	No capital letters or punctuation.	Capital letters or punctuation used (perhaps not appropriately).	Used capital letters and punctuation in at least one sentence.	Used capital letters and punctuation in two or more sentences.	
Macro-levels of language	Organization and message intent ****	Message is incomprehensible to the reader.	Although not organized in a logical manner message is somewhat clear to the reader.	Message is comprehensible and organized logically in one sentence.	Over 2 or more sentences child develops an idea into a coherent message.	
					Total Score	__/ 15

Note: Informed by ***Halliday & Hassan, 1976; *MacKenzie, Scull, & Munsie, 2013; **McCutchen, 2011; ****Watanbe & Hall-Kenyon, 2011

Record the message written (circle cohesive ties)

Reliability and Validity. For the observational element, inter-rater reliability of ratings was established between three raters (the first author and two other raters). Kappa ratings ranged from $K = .62$ to $K = 1.0$. A two-way mixed consistency average that measures intra-class correlation (ICC) was also calculated to assess the degree to which coders provided consistency in their ratings of the items and ranged between .78 and 1.0 ($p > .05$). The alpha coefficient was .78. Inter-items correlations were also calculated and none were so high that one might consider they were measuring the same thing. For the written message element, Kappa ratings ranged from $\kappa = .51$ to $\kappa = .65$. An ICC was calculated and ranged between .70 and .86 ($p < .05$) and were, thus, sufficient for research purposes (Graham, Milanowski, & Miller, 2012).

In terms of validity, convergent validity was established between the OSELA's HRSW task and WV (Clay, 2013) and growth on items that considered use of letter-sound information, orthographic information, and writing vocabulary. Results demonstrated correlation between growth in use of letter-sound relationship and WV ($r = .53$, $p < .01$), and HRSW ($r = .33$, *ns*). There was also a correlation between growth in use of orthographic information and WV ($r = .43$, $p < .01$), and HRSW ($r = .33$, *ns*). Another source of validity evidence is that the assessment was sensitive to change over occasions, as reported in Results.

Results

Differences in Change Over Time in Children's Use of Sources of Information

General changes. Differences in change over time in observed writing behaviors that would infer that children were using sources of information like oral language, orthographic or letter-sound information, and knowledge about how print works were considered at group level. To describe overall patterns in group change over time, measures of central tendency for first and final observations were calculated using SPSS (see Table 2). At first observation, the slow-

progress group had higher mean ratings than the fast-progress group for all items except for use of letter-sound relationships and written vocabulary. An independent samples t-test demonstrated that the only difference between groups that was statistically significant was that the use of directional rules by the slow-progress group (M = 2.88, SD = .35) was higher than the fast-progress group's (M = 2.17, SD = .75) means, $t_{(12)} = 2.36$, $p < .05$, $d = 1.21$.

Table 2.

Mean EWOR Ratings: Slow (n = 8) and Fast (n = 6) Progress Groups at First and Final Observation

Item	Slow Progress Group (n = 8)				Fast Progress Group (n = 6)			
	First		Final		First		Final	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Composing	1.75	0.87	2.50	0.75	1.50	0.55	2.33	0.82
Visual Information	0.63	0.52	0.87	0.35	0.50	0.55	1.50	0.55
Letter-sounds	1.13	0.35	1.38	0.52	1.16	0.41	2.00	0.53
Writing Vocabulary	1.75	0.87	2.00	0.53	1.83	0.41	1.67	0.82
Concept of Word	2.50	0.53	2.62	0.52	1.83	0.75	2.83	0.41
Directionality	2.88	0.35	3.00	0.00	2.17	0.75	3.00	0.00
Rereading for more information	1.25	0.71	1.38	0.52	1.16	0.41	1.50	0.55
Rereading for accuracy	0.75	0.46	0.63	0.74	0.66	0.82	1.17	0.75
Self-correcting	0.12	0.35	0.00	0.00	0.00	0.00	0.50	0.55
Fluency	6.62	2.13	2.00	0.63	7.50	2.34	2.00	0.00

We examined differences between the observed writing behaviors of the slow- and fast-progress groups at the final observation. The fast-progress group had higher mean ratings for use of orthographic information, letter-sound relationships, and concept of word. The only statistically significant difference between the slow-progress group (M = .50, SD = .55) and the fast-progress group (M =1.50, SD = .55) was in terms of observed independence in use of orthographic information, $t_{(12)} = -2.61$, $p < .05$, $d = 1.81$.

Rate of change over time. Next, we considered the difference between the rates of change over time in both groups' use of sources of information. We used hierarchical linear modeling (Raudenbush & Bryk, 2002) to estimate group rates of growth between first and final observation for all items in the Using section of the rubric and a subtotal score (the sum of the items in this section). We ran a random coefficients regression model to estimate a rate of growth over time for the Using ratings of the rubric for each group. Time was entered as a predictor variable and the resulting equation was:

$$\text{Level 1: } Y_{ti} = \pi_{01} + \pi_{1i}\,(\text{time}) + e_{ti}$$

$$\text{Level 2: } \pi_{01} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

In terms of overall growth using the subtotal score, the resulting model for the rate of growth for the slow group was: rate of change over time in observed writing behaviors (Using) = 10.63 + 1.75 (time). In other words, the best estimate for the slow group's base Using sub-total score was 10.63 (out of a possible maximum of 18) and the best estimate for their rate of growth between first and last observation was 1.75, $p = .03$. In contrast, for the fast progress group the model was: rate of change in observed writing behaviors (Using) = 9.00 + 4.33 (time). The best estimate for this rate of growth was statistically significant ($p < .05$). Essentially, the fast-

progress group had a lower estimated base score with a rate of growth that was nearly 2.5 times that of the slow group.

The breadth and variability of change. To understand more about how the fast-progress group differed from the slow-progress group in use of sources of information, we compared the estimated rates of growth for each group (see Table 3) on each item in this section of the rubric. The fast-progress group had significant rates of growth in every item except writing vocabulary.

Table 3.

Rates of Growth on EWOR for Slow (n = 8) and Fast Progress Groups (n = 6)

Item	Slow Progress Group			Fast Progress Group		
	Co-efficient	t-ratio	*p* value	Co-efficient	t-ratio	*p* value
Using						
Composition	.75	2.19	*ns*	.83	2.97	*.03*
Visual Information	.25	1.63	*ns*	1.00	4.24	*.01*
Letter-sounds	.25	1.06	*ns*	.83	2.97	*.03*
Writing Vocabulary	.25	1.06	*ns*	-.16	-.45	*ns*
Concept of Word	.13	1.06	*ns*	1.00	3.00	*.03*
Direction	.13	1.00	*ns*	.83	2.73	*.04*
Using subtotal	**.63**	**.92**	***ns***	**4.33**	**3.49**	***.01***
Doing						
Rereading for information	0.13	0.38	*ns*	0.33	1.73	*ns*
Rereading for accuracy	-0.13	-0.45	*ns*	0.50	2.44	*.05*
Self-correction	-0.13	-1.03	*ns*	0.50	2.25	*ns*
Fluency	0.75	2.55	*.03*	0.83	2.71	*.04*
Doing subtotal	**0.63**	**0.98**	***ns***	**2.17**	**2.85**	***.04***

To further describe and examine the breadth and variability of change over time between the two groups we conducted a qualitative analysis of our sources of data. The rubric ratings could be interpreted as predefined codes that described aspects of the writing process, but without analysis, they might lack meaning. To display our data, and to analyze change over time,

we used an event-listing matrix for each child (Miles, Huberman, & Saldaña, 2014). Each item of the rubric formed the rows of the matrix and the columns represented time points. Miles et al. stated that this method of data display "permits a researcher to preserve the chronology of events and illuminate the processes that are occurring: (p. 194).

We displayed multiple sources of data in event-listing matrices to combine (1) descriptive statistics (the ratings in observed writing behaviors) and (2) observation notes from videos, and exemplars from the writing samples. Each cell was populated with the rubric rating and notes taken during observations. To extend description to the identification of essential features and the ways in which they interact (Glesne, 1999), we visually inspected matrices with three questions in mind: what changed, what stayed the same, and what emerged anew. We examined patterns from time-point to time-point and over the course of the intervention. We looked across each subconstruct with these three questions in mind and wrote descriptions about emerging patterns in narrative form. We annotated the matrices with symbols to illustrative a positive progression (as represented by +), a regression (as represented by -), or a new observed behavior (represented by *) in the sources of information the child used. Having described and analyzed the patterns for each child in each group, we were faced with the task of identifying the characteristics of change over time for each group in the fast or slow progress groups. To do this, we collapsed the data contained in the individual event listing matrices to a group matrix and analyzed this data for patterns of change over time. This analysis revealed two key areas that differentiated the fast- and slow-progress groups, namely composing and use of orthographic information.

Composing. Both the slow- and fast-progress groups were quite similar on first observation. The children in both groups needed, in general, high support to compose a message

or could write a simple message with less support. By the last observation, five of the eight children in the slow-progress group and four out of six children in the fast-progress group had made a positive progression in terms of their control of language to compose a message. Where they differed was both the efficiency with which they composed their messages and the emergence of student control of topic.

The children in the slow-progress group did indicate, at times, that they did not wish to write about a certain topic. They were, however, unable (or did not have the opportunity) to, steer the conversation towards something they wanted to write about. Often the teacher would suggest an alternate topic, or pursue the same topic. Take, for example, this vignette of Ethan and his teacher, during the conversation before writing on the final observation.

Teacher:	If you went fishing in the sea what would you like to catch?
Ethan:	I already wrote a story. I don't want to.
Teacher:	Listen you are doing such a good job. I would like to know what you would like to catch. Butterflies don't live in the sea. Would you catch a dinosaur? They don't live in the sea. What would you catch? Do you know something that lives in the sea? Oh you want to look (child picks up book). A snapper? Oh that's cool. Let's write a story. Tell me what you would say?
Ethan:	I like to catch fish in the sea.
Teacher:	I like to catch fish in the sea. Oh that's a beautiful story.

(Week 15, Lesson 45)

In this example, although Ethan had indicated he did not want to write about the topic, his teacher persisted in talking about the topic until he finally composed a message. This demonstrated the lack of opportunity some of the slow-progress children had to pursue a topic of interest in terms of their composition.

Ownership of the message was a hallmark of the fast-progress group. We noted for teachers whose students made fast progress that, of the six observed writing events, four children changed the topic to one that they wanted to write about or had a message ready to write. Paul, a student in the fast group, exemplifies this. In the following vignette, the teacher introduces a topic but, misunderstanding the topic, Paul indicates that he would prefer to write about something different and the teacher, open to change, provides minimal support to help him reshape his composition.

Teacher:	The Billy Goats like to eat green, green grass, don't they? So they go over the bridge every day, so they always have green, green grass to eat. What are you going to eat?
Paul:	I don't like to eat-
Teacher:	You don't like to eat grass, I know.
Paul:	Yes.
Teacher:	Well what do you like to eat?
Paul:	Um.
Teacher:	What do you think we can write?
Paul:	No (inaudible) pencils. I know what - pencils to write.
Teacher:	What do you know to write?
Paul:	I have a lot of pencils in my pencil box. I work with my pencil at my house and at the school with every stuff.
Teacher:	I work with my pencils
Paul:	Every stuff
Teacher:	What? On everything you mean?
Paul:	Yes.
Teacher:	Okay, I have a lot of pencils in my pencil box. I work with my pencils at home and at school.
Paul:	And at my….. and at my house.

(Week 17, Lesson 61).

Use of orthographic information. Children in the slow-progress group did not exhibit much change over time in use of orthographic information and this pattern of change did not vary amongst the group. Two children received a rating of 0 in the first observation and received a rating of 1 in the final observation. For all other children (n = 6) the ratings remained the same (a rating of 1). For example, Hailey wrote the sentence "I would go play on the monkey bars and

swing off" Her teacher contributed the /ould/ in "would," the /ay/ in "play," and the /ar/ in "bars," The children in the slow-progress group were only ever observed to exhibit use of orthographic information once.

In contrast, three children in the fast-progress group made positive progress in their use of orthographic information, meaning that their ratings between first and final observation increased. For two students, the use of orthographic information emerged as a new behavior over time. For example, in the first observation Paul's teacher contributed the second /l/ in the word "will." By the final observation, Paul was observed to work competently with spelling patterns like the vowel-consonant /–e/ pattern for the word "home." One student remained the same in terms of use of orthographic information.

Similarities. Both the fast- and slow-progress groups were similar in terms of use of letter-sound information in that half of the children stayed the same in terms of observations of independently hearing and recording sounds in words, and the other half improved. We also noted little difference in the number of words written independently. Thirty-seven percent (*n* = 20) of the words in the slow group's written messages were written independently and 33% (*n* = 15) of the fast-progress group's were produced independently. By the final observation, 41% (*n* = 65) of the words in the slow group's written messages and 39% (*n* = 22) of the fast-progress group's were produced independently. By the final observation all children controlled directional movement and could space words without help.

In summary, in terms of use of sources of information, most children in this literacy intervention could control directional movement and had a good concept of word. Over time, differences emerged between the slow- and fast-progress groups, particularly in their use of orthographic information or ability to use more complex spelling patterns. This was apparent in

observations of the writing events, statistically significant higher mean ratings, and a positive rate of growth in this area. In addition, the fast-progress group demonstrated a significant rate of overall growth in terms of their use of sources of information like composing, use of letter-sounds relationships, and directional rules about print. We also noted a trend towards more ownership of the composition process.

Differences in Change Over Time in Children's Strategic Activity Inferred by Observed Writing Behaviors

General Changes. Similar to our analysis of change over time in the sources of information that children used, we first examined measures of central tendency at first and final observation of behaviors like rereading for the next word, rereading for accuracy, and self-correction. Taken together, these behaviors would infer active monitoring, searching, and cross-checking (see Table 2). We referred to this problem-solving as *doing*. We also considered children's overall fluency. Results indicated that the difference in observed self-correction between the slow-progress group (M = .00, SD = .00) and the fast-progress group (M = .50, SD = .55), was statistically significant, $t_{(12)} = -.50$, $p < .05$, for the final observation.

Rate of change over time. We used the same method of analysis (HLM) that we utilized in Research Question 1 to estimate a rate of growth for the slow- and fast-progress groups in terms of observed behaviors that would infer strategic activity. We ran a random coefficients regression model to estimate the rate of growth over time for the Doing ratings using the rubric ratings for each group. Time was entered as a predictor variable and the resulting equation was:

$$\text{Level 1: } Y_{ti} = \pi_{01} + \pi_{1i}(\text{time}) + e_{ti}$$

$$\text{Level 2: } \pi_{01} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

The model for the rate of growth for the slow group was: rate of change over time in Doing= 3.37 + .63 (time). The best estimate for the slow group's base Doing score was 3.37 (out of a possible maximum of 12) and the best estimate for their rate of growth between first and last observation was .63, $p = .39$. In contrast, for the fast-progress group the model was: rate of change in Doing = 3.00 + 2.17 (time). The best estimate for their base score was 3.00 and the best estimate for the rate of growth was 2.17, $p < .05$. Similar to their use of sources of information, the fast-progress group had lower estimated base scores but had a rate of growth that was nearly 3.5 times that of the slow group and was also statistically significant.

In terms of the rates of growth for individual items, both groups had statistically significant rates of growth in fluency (see Table 3) and the fast-progress group had a significant rate of growth in terms of rereading for accuracy. It is worth noting, however, that the rate of growth in terms of rereading for accuracy and self-correction was negative (-.13) between time points for the slow group and positive (.50) for the fast-progress group. The fast-progress group was demonstrating positive rates of growth in observed behaviors like rereading and editing, which infers they were more active in monitoring the accuracy of their written messages.

The breadth and variability of change. Next, we examined the breadth and variability of children's strategic activity inferred by observable editing behaviors like pausing, rereading, and revising. To do this we examined the data displayed in event listing matrices (Huberman et al., 2014) as described previously.

Rereading for more information. We examined our data to consider change over time in rereading behaviors that might infer that children were searching for more information. This behavior was hallmarked by the child rereading their sentence or a word when they were looking to generate the next letter or the first letter of a new word. The slow group was variable in terms

of their control of these behaviors. Three children regressed by the final observation, three stayed the same, and only two showed a progression. In contrast, for the fast-progress group we noted stability over time in this behavior. All children exhibited this behavior at least once at first and final observation, and three children exhibited the behavior on a few occasions by the final observation.

Rereading for accuracy. We then inspected the slow and fast group's event listing matrices to examine how the slow- and fast-progress groups differed in terms of rereading for accuracy. Four children in the slow-progress group reread at least once to monitor the accuracy of what they had written. At the first observation four of the six children in the fast-progress group reread their sentence at least once for accuracy. For example, Courtney wrote *anb* instead of *and* she looked back, and said to the teacher "that's not right," although she could not do anything about it.

By the final observation, all but one of the fast-progress group reread at least once to monitor the accuracy of their message. In contrast, the slow-progress group again exhibited variability and limited control of this behavior. Half (n = 4) of the group were only observed to reread the accuracy of their message once and three children regressed by not rereading for accuracy at all.

Self-correction. Self-correction involves noticing and correcting an error independently. At the first observation, all children but one failed to notice and self-correct an error. By the final observation half (n = 3) of the fast-progress group were observed to notice, comment on, and fix an error. None of the children in the slow-progress group noticed, let alone fixed, an error. It seems that, as a group, the fast-progress group began to show early self-correcting behaviors. In

terms of noticing or self-correcting an error, all these behaviors were related to errors at letter- and not at word-level.

Fluency. We also considered the fluency with which children transcribed the message onto the page. Children in both the slow- and fast-progress group demonstrated similar patterns of change over time, but by the end of the intervention all children's writing was mostly fast and fluent, faltering only over unknown words.

In summary, children in the fast-progress group had significant rates of growth in terms of observed behaviors like rereading what was already written for accuracy or reading in an effort to generate the next word. They also were observed to self-correct, a behavior that only occurred once in the 16 observations of the slow-progress group. This emerging behavior was restricted to noticing letter-level errors.

Differences in Change Over Time in Children's Written Messages

General changes. We examined overall average ratings in terms of children's ratings in terms of legibility and linguistic complexity of the written messages produced by the slow- and fast-progress groups (see Table 4). The differences in means for the fast-progress group were higher for all items, except linguistic texture which was the same as the slow-progress group. The difference between means was statistically significant for legibility, $t_{(672)}$, -2.85, $p < .05$, $d = .23$, linguistic complexity, $t_{(672)}$, -3.63, $p < .01$, $d = .28$, organization, $t_{(672)}$, -2.05, $p < .05$, $d = .1$, and overall total score, $t_{(672)}$, -2.85, $p < .05$, $d = .22$.

Table 4.

Mean EWOR (Written Message) Ratings: Slow (n = 8) and Fast Group (n = 6)

Item	Slow-Progress Group (*n* = 374)		Fast-Progress Group (*n* = 300)	
	M	*SD*	*M*	*SD*
Legibility	1.64	0.71	1.79	0.58
Linguistic Complexity	1.43	0.51	1.58	0.53
Linguistic Texture	1.84	0.84	1.84	0.93
Punctuation	1.80	0.46	1.88	0.48
Organization	2.00	0.30	2.03	0.30
Total Score	8.71	1.71	9.12	1.94

Change over time. Change over time in general features of children's written messages at six intervals over the course of the intervention were calculated by calculating measures of central tendency in the legibility, linguistic complexity, linguistic texture, punctuation and capitalization, and organization of their messages. The six intervals consisted of average ratings for Lessons 10, 12, and 13 (Time 1), Lessons 20, 21, and 22 (Time 2), Lessons 30, 31, and 32 (Time 3), Lessons 40, 41, and 42 (Time 4), and Lessons 50, 51, and 52 (Time 5), and Lessons 60, 61, and 62 (Time 6). Our rationale for using these three lessons at these time points would be that average ratings would be less likely to include error than if we chose single lessons and that the ratings would be taken at equal points in the children's programs.

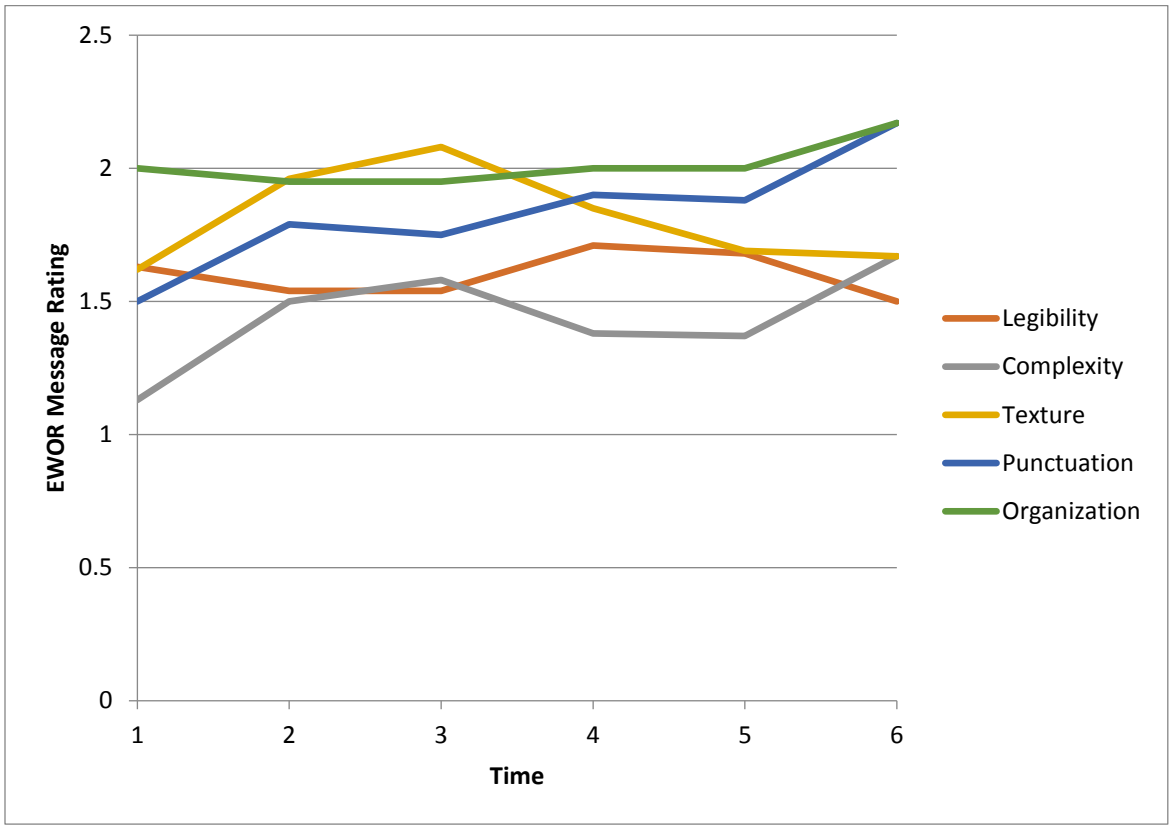
To examine if differences existed between groups, we conducted an independent t-test between groups on each of the constructs at each of these points in time. This analysis revealed

little. None of the differences between groups were statistically significant, except for the difference between the average mean legibility and linguistic texture ratings at Time 2. The mean legibility rating of the fast-progress group (M = 1.94, SD = 0.42) was higher than that of the slow-progress group (M = 1.54, SD = 0.72), $t_{(40)}$, -2.16, $p < .05$, d = .68. The mean linguistic texture rating of the low-progress group (M = 1.95, SD = 0.95) was higher than that of the fast-progress group (M = 1.28, SD = 1.01), $t_{(40)}$, 2.22, $p < .05$, d = .68.

Paths of change over time. We knew that the average ratings for each group, in terms of the legibility and complexity of their written messages, varied little. We wanted to consider, however, how these messages changed over time and how these progressions differed for the slow- and fast-progress groups. To do this we plotted empirical growth plots with time (by time points 1 through 6) on the x-axis and average ratings on the y-axis to visually inspect the path of change over time for each item (Singer & Willett, 2003). For the slow-progress group, we noted that average ratings ranged between one and 2.5. When ratings in micro-levels of language (linguistic complexity) rose, ratings in terms of legibility tended to dip and vice versa (see Figure 3). Message organization changed little over time.

Figure 3.

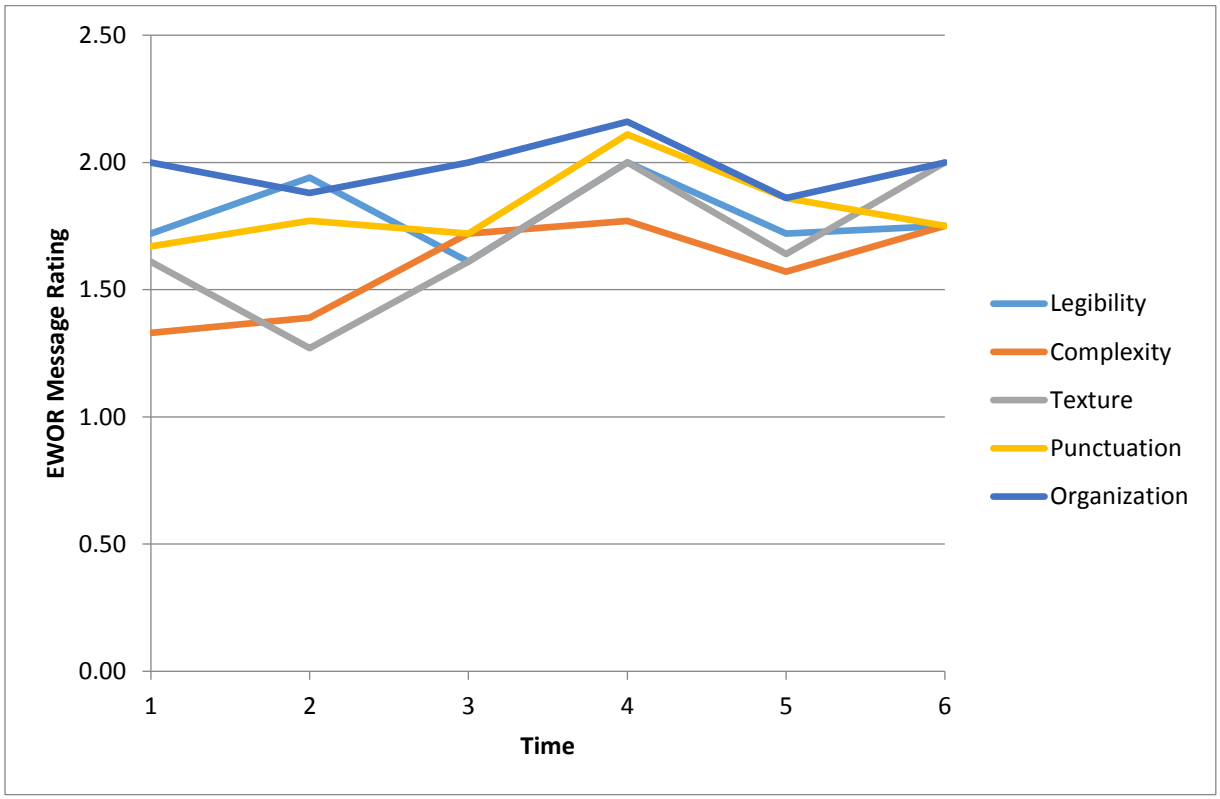
Path of Change Over Time in EWOR: Written Message for Low-Progress Group (*n* = 8)



For the fast-progress group, we noted that over time ratings became more closely aligned (see Figure 4). In other words, ratings became more closely intertwined. In a similar pattern to the slow-progress group, ratings in message legibility corresponded with dips in micro-levels of language (linguistic texture). This pattern, however, dissipated halfway through the intervention.

Figure 4.

Path of Change Over Time in EWOR: Written Message for Fast-Progress Group (*n* = 6)



Rates of change. We used HLM to estimate group rates of change in the linguistic complexity and legibility of children's written messages. Similar to Research Questions 1 and 2, we ran a random coefficients regression model to estimate the rate of growth over time for the written message rubric ratings for each group. Time was entered as a predictor variable and the resulting equation was:

$$\text{Level 1: } Y_{ti} = \pi_{01} + \pi_{1i}\,(\text{time}) + e_{ti}$$

$$\text{Level 2: } \pi_{01} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

The model for the rate of growth for the slow group was: rate of change over time in written message = 3.37 + .63 (time). The best estimate for the slow group's base written message

ratings was 8.31 (out of a possible maximum of 15) and the best estimate for their rate of growth over the course of the intervention was .01, $p = .04$. In contrast, for the fast-progress group the model was: rate of change in written message = 8.88 + .01 (time). The best estimate for this rate of growth was, however, not statistically significant, $p = .09$.

We also examined each item on the rubric to consider if there were differences in terms of the rates of growth in terms of the legibility of their messages, and micro- and macro-levels of language. The results demonstrated there was little growth for either group. For both groups their rate of overall growth was a tenth of scale score per ten lessons and they exhibited flat rates of growth over time (see Table 5).

Table 5.

Rates of Growth on EWOR (Written Message) for Slow- (n =8) and Fast- (n = 6) Progress Groups

Item	Slow Progress Group			Fast Progress Group		
	Co-efficient	*t*-ratio	*p* value	Co-efficient	*t*-ratio	*p* value
Legibility	.00	0.81	*ns*	.00	-0.67	*ns*
Linguistic complexity	.00	0.58	*ns*	.00	2.77	*.01*
Linguistic Texture	.00	2.82	*.01*	.00	0.54	*ns*
Punctuation	.00	3.17	*ns*	.00	1.46	*ns*
Organization	.00	1.55	*ns*	.00	0.15	*ns*
Message Total	**.01**	**1.98**	***.04***	**.01**	**1.19**	***ns***

Discussion

The purpose of our study was to provide a description of the differences in change over time in the early writing development of two groups of children, identified as at risk of later literacy difficulties, who made differential progress in the context of an early literacy intervention. Specifically, we described differences between what and how children, who made fast progress and those who made slow progress, wrote. First, we sought to describe differences in how each group's use of sources of information while writing changed over time. Second, we described differences in how each group's observable writing behaviors (rereading as if to search for information or to monitor for accuracy, self-correction, and overall fluency) that inferred strategic actions changed over time. Third, we described differences in how the linguistic complexity and legibility of each group's written messages changed over time.

Change in use of Sources of Information is Multi-Dimensional for Fast-Progress Writers

We examined how children's independence in composing a message, use of letter-sound relationships, use of orthographic information, use of knowledge about conventions of print, and use of a writing vocabulary changed between the beginning and end of the intervention. Our findings demonstrated that the fast-progress group had higher overall ratings at the end of the intervention, as measured by the rubric total score. This was despite the fact that the slow-progress group's ratings were higher than the fast-progress group's ratings at the start of the intervention.

The fast-progress group's rate of growth in their use of sources of information was nearly 2.5 times that of the slow group overall. When we examined rates of growth on individual items on the rubric we noted that the fast-progress group's rate of growth was positive and statistically significant in terms of their use of language to compose a message, use of letter-sound and orthographic information, and use of conventions of print. These results echo the findings of

Kamberelis (2002), who concluded that change over time in observed writing behaviors was multidimensional and simultaneous. Unlike Kamberelis (2002), however, because we identified both a slow- and fast-progress group we found that this was only true for the fast-progress group.

By the end of the intervention, fast-progress writers were beginning to move beyond merely encoding simple letter-sound correspondences in their independent spelling. Moreover, this group were observed to independently use more complex spelling patterns. It makes sense that this group were then able to produce more words independently and accurately at the end of the intervention in the WV task. These finding echoes that of McGee et al. (2015) about reading because it demonstrates that children must also become adept at using the code in writing if we expect them to achieve first-grade writing benchmarks. Indeed, as Boocock et al. (1998) stated, experiencing success solving the task of writing new words would likely add, in a reciprocal manner, to children's writing vocabulary which in turn would "allow for the possibility of extending knowledge about the orthographic regularities and morphemic units across words" (p. 42). This emerging ability to use orthographic information bodes well in terms of overall literacy development, with research suggesting that orthographic awareness accounts for variance in later literacy development over and above phonological abilities (Dreyer, Luke, & Melican, 1995).

Composing, a cognitively demanding task, involves generating an idea to write and translating this message from oral to written form can be understood by others (Galbraith, 2009). In our study, the fast-progress group, the children who produced more words at the end of the intervention, were not only better spellers, but also could compose messages in a more independent manner. They had a statistically significant rate of growth on this item, indicating that they were composing more with less teacher help and over time demonstrated flexibility to change the topic of their message. Qualitative analysis of the conversations that occurred

between the teacher and child prior to writing the messages also revealed that fast-progress writers were able to change the topic of conversation and compose independently. We suggest this may be due to two factors. First, the children in the fast-progress group may have had better control of oral language. Children experiencing difficulties in oral language development face significant difficulties in the production of written texts (Dockrell & Connelly, 2015). Two, the actual process of co-constructing the message with teacher support may have been more effective. As Myhill and Jones (2009) suggested, the process of oral rehearsal and dialogue with a peer or adult can help children to compose as it gives children the opportunity to organize their thoughts and bridge the gap between thought and text. The reason is unclear and certainly warrants further analysis because it is clear that children who made slow progress were less able to change the topic of conversation and compose independently.

Revision Behaviors Were the Hallmark of the Fast-Progress Group

Our second research question revolved around the emergence of observable writing behaviors like rereading as if to search for more information, rereading as if to monitor that accuracy of the written message, and self-correction. Taken together these behaviors could be considered both as leading to or being directly involved in the revision process (Fitzgerald, 1987). Our results indicated that, overall, the fast-progress group had a statistically significant rate of growth that was nearly 3.5 times that of the slow-progress group in the rubric's Using subtotal scores. Although both groups had positive rates of growth for fluency, only the fast-progress group had positive rates of growth for rereading for accuracy. In fact, the slow-progress group had negative rates of growth for rereading for accuracy and self-correction. Our qualitative analysis supported these results in that the fast-progress group were observed to take steps that

would lead to them potentially noticing an error (rereading), then noticing errors, and attempting to fix the error, albeit at letter rather than word level.

It seems, therefore, that similar to models of skilled writing, that these actions of reviewing and revising were important and were what set the fast-progress group apart from the slow-progress group in observable writing behaviors. Clay (in Doyle, 2013) asserted that self-correction, and the problem-solving it entails, is tutorial for readers as it reinforces the processes of monitoring, searching, choosing, and evaluating and lifts the child to deal with new levels of complexity (p. 642). Perhaps, in a sense, the same might be true for writing.

Little Change or Difference in Written Messages

Our third research question focused on change over time in the legibility and linguistic complexity of the children's written messages. Although overall the fast-progress group had higher ratings than the slow-progress group, there was little growth over time for either group. Essentially, both groups continued to write linguistically simple messages of one to two sentences on a daily basis. Perhaps this finding is due to the confines of time within the RR lesson. Equally, this may be all that they were expected to write and were not supported to extend their message.

This finding in itself poses two challenges. First, in today's classrooms, children's progress is judged solely on their written messages through the use of rubrics (e.g. Calkins, 2013). Had we judged progress solely on what was written in this study, we would have found that there was little difference between both groups. In this study, the main difference that set the slow- and fast-progress writers apart was not in what they wrote but how they wrote. This has implications for both writing assessment and instruction, particularly for children at risk of later literacy difficulties. Second, the simple messages of one or two sentences produced in this study

did not resemble standards set forth by the Common Core State Standards (National Governors Association for Best Practices, 2010) for first grade. Perhaps by the end of first grade the children might be able to meet these standards.

Dips in Legibility Coincide with Increases in Micro-levels of Language.

By plotting change on empirical growth plots, we found that as children's messages became more linguistically complex at a micro-level (for example, by using more cohesive ties), they received lower ratings for legibility and vice versa. This finding supports the idea of development proceeding in overlapping waves (Siegler, 2006) with approaches to a task being variable before reaching stability. It also echoes Galbraith's (2009) assertion that as task demands increase, other processes may be compromised. We found that the fast-progress group seemed to coordinate ratings over time meaning that the ratings across items that considered micro- and macro-levels of language and legibility were similar. As the fast-progress group appeared to achieve more stability and integration between writing linguistically more complex messages, they simultaneously controlled lower-order transcription skills. Their approach to the task of writing was, perhaps, becoming less variable, and more integrated as posited by overlapping waves theory (Siegler, 2006).

Limitations and Future Directions

As with any study it is necessary to acknowledge potential limitations of our study. One limitation of our findings is that our descriptions of differences in writing development are restricted to the population we studied, one small group of struggling writers in a specific intervention. We suggest, however, that such a population was ideal for the purpose of our study. Similar to Sharp et al.'s (2012) study of spelling development, we hypothesized that by conducting our study with this population (struggling first graders), we were likely to observe a

period during which rapid growth might occur. We applied stringent criteria to identify our candidates using a well established measure of early written production, the WV task from the OSELA (Clay, 2013).

We expected rapid growth because participants all started the intervention with similar ability in writing in terms of written production. In addition to this, with an intervention that has the same lesson framework for each daily lesson one would expect rapid growth over time. Thus, the participants in this study provided us with the opportunity to see development slowed down (due to the nature of their difficulties) but also accelerated (due to the nature of the intervention). Like Sharp et al. (2012) we do, however, accept that the greatest periods of change might have already occurred prior to the study, or perhaps had yet to occur. Given the definitive time span of the intervention and the use of an extant data set, we were unable to study either.

It is plausible that the nature of the writing segment of the RR lesson may have constrained development. Because the segment is short (no more than approximately ten min) the children were limited in what they could write. A counter argument to this might be that with increased fluency the children could and perhaps should have written more. A benefit of using the writing section of the RR lesson in this study was that message intent was free to vary because children are engaged in a conversation where they can write about a topic that interests them (cf. Clay, 2005, p. 54). In addition to this, similar instructional formats were repeated during each writing event and, indeed, between teachers. We suggest, therefore, that the benefits of studying change over time within this instructional format outweighed the disadvantage of the short time span.

An element of the study that we did not attend to was teacher instructional moves. Rather, we concentrated on describing children's writing development within an instructional

context, not a controlled independent task. We did this because we were interested in the genesis of independence within this instructional context. We agree with Bergmann, Magnusson, and El-Khouri (2003) that the functioning of an individual within the situation in which development occurs permits a more nuanced and holistic understanding of development as it naturally occurs. Certainly, if we had examined change by looking at written messages only and not considering observed writing behaviors we would have learned little about the differences between groups. It is certainly plausible that variation in development could be attributed to teacher instruction, particularly in terms of conversations prior to writing, and, indeed, teacher's expectations in terms of message length. We also did not examine confounding factors like individual socioeconomic status.

We suggest that this study points towards different avenues of inquiry to build on the knowledge gained from this study. First, we suggest that it is imperative that this type of study is replicated in a kindergarten or first-grade classroom using a design similar to Clay's (1966) original research. Such a study would provide valuable information about typical and atypical development in a general education classroom. Second, understanding more about the nature of teacher instruction, instructional moves, and interactions of the teachers in this study would be useful. Third, given that our findings suggest that certain behaviors were associated with change it would be worth testing these findings empirically in an intervention study.

Conclusion

Learning to write is a complex but important element of the process of becoming literate. In this study we described the rates, paths, breadth, and variability of change over time in the writing of two groups, both identified as at risk of later literacy difficulties, who made differential progress in the context of a literacy intervention. We found that what set the groups

apart was not in what they wrote but how they wrote, the sources of knowledge they drew upon and the editing behaviors they demonstrated as they wrote. This information is important as it points towards the types of experiences and behaviors that children who beat the odds and catch up with their peers exhibited thus pointing towards optimal instructional contexts for struggling writers (McNaughton, 2011b). Finally, although we found that change in written messages occurred in waves, little changed in the complexity of children's messages which raises the question: Is judging progress on written products alone satisfactory?

References

Beard, R., Myhill, D., Riley, J., & Nystrand, M. (2009). *The Sage handbook of writing development*. London, UK: Sage.

Bergman, L. R., Magnusson, D., & El-Khouri, B. (2003). *Studying individual development in an inter-individual context: A person-oriented approach.* Mahwah, NJ: L. Erlbaum Associates.

Bloodgood, J. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly, 34,* 342-367. DOI: https://doi.org/10.1598/RRQ.34.3.5

Both-de Vries, A., & Bus, A. G. (2008). Name writing: A first step to phonetic writing? Does the name have a special role in understanding the symbolic function of print? *Literacy Teaching and Learning, 17,* 37-55.

Boocock, C., McNaughton, S., & Parr, J. (1998). The development of a self-extending system in writing. *Literacy Teaching and Learning*, *3*(2), 41-58. Retrieved from http://www.earlyliteracyinfo.org/documents/pdf/doc_124.pdf

Cabell, S., Justice, L., Zucker, T., & McGinty, A. (2009). Emergent name-writing abilities of preschool-age children with language impairment. *Language, Speech & Hearing Services in Schools, 40,* 53-66. DOI: https://doi.org/10.1044/0161-1461(2008/07-0052)

Calkins, L. (2013). *Writing pathways: Performance assessments and learning progressions, Grades K-8.* Portsmouth, NH: Heinemann.

Chanquoy, L. (2009). Revision processes. In R. Beard, D. Myhill, J. Riley, & M. Nystrand (Eds.), *The Sage handbook of writing development (pp. 80-97)*. London, UK: Sage. DOI: https://doi.org/10.4135/9780857021069.n6

Chen, Z., & Siegler, R. S. (2000). Across the great divide: Bridging the gap between understanding of toddlers' and older children's thinking [Monograph]. *Monographs of the Society for Research in Child Development, 65*(2), 1-105. Retrieved from http://www.jstor.org/stable/3181574

Clay, M. M. (1966). *Emergent reading behaviors*. Unpublished doctoral dissertation. Department of Curriculum and Pedagogy, University of Auckland, New Zealand.

Clay, M. M. (2001). *Change over time in children's literacy development*. Auckland, NZ: Heinemann.

Clay, M. M. (2005). *Literacy lessons designed for individuals: Part 2 teaching procedures*. Portsmouth, NH: Heinemann.

Clay, M. M. (2013). *An observation survey of early literacy achievement*. Portsmouth, NH: Heinemann.

Clay, M. M. & Cazden, C. B. (1990). *A Vygotskian interpretation of Reading Recovery.* In L. C. Moll (Ed.), *Vygotsky and education: Instructional implications and applications of socio-historical psychology* (pp. 206–222). Cambridge, UK: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9781139173674.010

D'Agostino, J. V., Rodgers, E., & Mauck, S. (2017). Addressing inadequacies of the Observation Survey of Early Literacy Achievement. *Reading Research Quarterly*. DOI: https://doi.org/10.1002/rrq.181

DeFord, D. (1994). Early writing: Teachers and children in Reading Recovery. *Literacy Teaching and Learning: An International Journal of Early Literacy, 1*, 31-56.

Dockrell, J. E., & Connelly, V. (2015). The role of oral language in underpinning the text generation difficulties in children with specific language impairment. *Journal of*

Research in Reading, 38(1), 18-34. DOI: https://doi.org/10.1111/j.1467-9817.2012.01550.x

Doyle, M. A. (2013). Marie M. Clay's theoretical perspective: A literacy processing theory. In D. E. Alvermann, N. Unrau, & R. B. Ruddell (Eds.), *Theoretical models and processes of reading, sixth edition* (pp. 636-656). Newark, DE: International Reading Association. DOI: https://doi.org/10.1598/0710.26

Dreyer, L. G., Luke, S. D., & Melican, E. K. (1995). Children's acquisition and retention of word spellings. *Neuropsychology and Cognition, 11,* 291–320. DOI: https://doi.org/10.1007/978-94-011-0385-5_9

Dyson, A. H. (1983). Role of oral language in early writing processes. *Research in the Teaching of English, 17*, 1-30.

Fitzgerald, J. (1987). Research on revision on writing. *Review of Educational Research, 4*, 481-506. DOI: https://doi.org/10.3102/00346543057004481

Fitzgerald, J., & Shanahan, T. (2000). Reading and writing relations and their development. *Educational Psychologist, 35,* 39-50. DOI: https://dx.doi.org/10.1207/S15326985EP3501_5

Flynn, E., Pine, K., & Lewis, C. (2006). The microgenetic method: Time for change? *The Psychologist, 19,* 152 -155.

Galbraith, D. (2009). Writing what we know: Generating ideas in writing. In R. Beard, D. Myhill, J. Riley, & M. Nystrand (Eds.), *The Sage handbook of writing development* (pp. 48-64). London: Sage. DOI: https://doi.org/10.4135/9780857021069.n4

Glesne, C. (1999). *Becoming qualitative researchers: An introduction.* New York, NY: Addison Wesley-Longman.

Graham, S., & Hebert, M. (2012). Writing to read: A meta-analysis of the impact of writing and writing instruction on reading. *Harvard Educational Review, 81,* 710-744. DOI: https://doi.org/10.17763/haer.81.4.t2k0m13756113566

Graham, S., Bollinger, A., Booth Olson, C., D'Aoust, C., MacArthur, C., McCutchen, D., & Olinghouse, N. (2012). *Teaching elementary school students to be effective writers: A practice guide* (NCEE 2012-4058). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications_reviews.aspx#pubsearch

Graham, M., Milanowski, A., & Miller, J. (2012). *Measuring and promoting inter-rater agreement of teacher and principal performance ratings.* Center for Educator Compensation Reform.

Granott, N., & Parziale, J. (2002). Microdevelopment: A process oriented perspective for studying development and learning. In N. Granott & J. Parziale (Eds.). *Microdevelopment: Transition processes in development and learning* (pp.1-30). Cambridge, UK: Cambridge University Press. DOI: https://doi.org/10.1017/cbo9780511489709.001

Halliday, M., & Hassan, R. (1976). *Cohesion in English.* London, UK: Longman.

Haney, M. R. (2002). Name writing: A window into the emergent literacy skills of young children. *Early Childhood Education Journal, 30,* 101-105. DOI: https://doi.org/10.1023/A:1021249218339

Harmey, S. (2015). *Change over time in children's co-constructed writing* (Doctoral dissertation). Department of Teaching and Learning, The Ohio State University, Columbus

Harris, P., Fitzsimmons, P., & McKenzie, B. (2004). Six words of writing, many layers of significance: An examination of writing as a social practice in an early grade classroom. *Australian Journal of Language and Literacy, 27,* 27-45. Retrieved from http://ro.uow.edu.au/era/22/

Hayes, J. R., & Berninger, V. W. (2009). Relationships between idea generation and transcription: How the act of writing shapes what children write. In R. K. Braverman, K. Lunsford, S. McLeod, S. Null, & A. S. P. Rogers (Eds.), *Traditions of writing research* (pp. 166–180). New York: Taylor and Francis/ Routledge.

Jones, I. (1998). Peer relationships and writing development: A microgenetic analysis. *British Journal of Educational Psychology, 68,* 229-241. DOI: https://doi.org/10.1111/j.2044-8279.1998.tb01286.x

Juel, C. (1988). Learning to read and write: a longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*(4), 437-447. DOI: https://doi.org/10.1037/0022-0663.80.4.437

Juel, C., Griffith, P. L., & Gough, P. B. (1985). Reading and spelling strategies of first grade children. In J. A. Niles & R. Lalik (Eds.), *Issues in Literacy: A Research Perspective* (pp. 306-309). Rochester, NY: National Reading Conference.

Kamberelis, G. (2002). Coordinating writing and reading competencies during early literacy development. *The Fifty-First Yearbook of the National Reading Conference, 51,* 227-241.

MacArthur, C. & Graham, S. (2016). Writing research from a cognitive processing perspective. In C.A. McArthur, S. Graham & J, Fitzgerald (Eds.), *Handbook of writing research* (2nd ed., pp. 24 -40). New York, NY: The Guildford Press.

MacKenzie, N. M., Scull, J., & Munsie, L. (2013). Analysing writing: The development of a tool for use in the early years of writing. *Issues in Educational Research, 23*(3), 375 - 393. Retrieved from http://www.iier.org.au/iier23/mackenzie.pdf

McCutchen, D. (1996). A capacity theory of writing: Working memory in composition. *Educational Psychology Review, 8,* 299-324. DOI: https://10.1007/BF01464076

McCutchen, D. (2011). From novice to expert: Implications of language skills and writing-relevant knowledge for memory in the development of writing skill. *Journal of Writing Research, 3*, 51-68. DOI: https://doi.org/10.17239/jowr-2011.03.01.3.

McGee, L. M., Kim, H., Nelson, K. S., & Fried, M. D. (2015). Change over time in first graders' strategic use of information at point of difficulty in reading. *Reading Research Quarterly, 50*, 263-291. DOI: https://doi.org/10.1002/rrq.98

McNaughton, S. (2011a). Sensitive events in literacy development. In H. Hedges, J. Parr, & S. May (Eds.), *Changing trajectories in teaching and learning* (pp. 1-14). Wellington, NZ: NZCER Press.

McNaughton, S. (2011b). Child development studies over time. In D. Lapp & D. Fisher (Eds.), *Handbook of research on teaching the English language arts* (3rd ed., pp. 400-405). New York, NY: Routledge.

May, H., Gray, A., Sirinides, P., Goldsworthy, H., Armijo, M., Cecile, S., . . . Tognatta, N. (2015). Year One results from the multisite randomized evaluation of the i3 scale-up of

Reading Recovery. *American Educational Research Journal, 52,* 547-581.DOI: https://doi.org/10.3102/0002831214565788

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook.* Thousand Oaks, CA: SAGE Publications Limited.

Myhill, D., & Jones, S. (2009). How talk becomes text: Investigating the concept of oral rehearsal in early years' classrooms. *British Journal of Educational Studies, 57,* 265-284. DOI: https://doi.org/10.1111/j.1467-8527.2009.00438.x

National Center on Response to Intervention (2010). *Users Guide to Universal Screening Tools Chart.* Washington, DC: U.S. Department of Education, Office of Special Education Programs, National Center on Response to Intervention. Retrieved from http://www.rti4success.org/observation-survey-early-literacy-achievement-reading#class

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core state standards*. Washington, DC: Author.

Ouellette, G., & Sénéchal, M. (2008). Pathways to literacy: A study of invented spelling in the role of learning to read. *Child Development, 79*, 899–913. DOI: https://doi.org/10.1111/j.1467-8624.2008.01166.x

Ouellette, G., & Sénéchal, M. (2017). Invented spelling in kindergarten as a predictor of reading and spelling in Grade 1: A new pathway to literacy, or just the same road, less known? *Developmental Psychology, 53*, 77-88. DOI: https://doi.org/10.1037/dev0000179

Puranik, C. S., & Lonigan, C. J. (2014). Emergent writing in preschoolers: Preliminary evidence for a theoretical framework. *Reading Research Quarterly, 49,* 453-467. DOI: https://doi.org/10.1002/rrq.79

Puranik, C. S., Lonigan, C. J., & Kim, Y. S. (2011). Contributions of emergent literacy skills to name writing, letter writing, and spelling in preschool children. *Early Childhood Research Quarterly, 26*, 465-474. DOI: https://doi.org/10.1016/j.ecresq.2011.03.002

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods.* Thousand Oaks, CA: Sage Publications.

Rittle-Johnson, B., & Siegler, R. S. (1999). Learning to spell: variability, choice, and change in children's strategy use. *Child Development, 70*, 332-348. DOI: https://doi.org/10.1111/1467-8624.00025

Sharp, A. C., Sinatra, G. M., & Reynolds, R. E. (2008). The development of children's orthographic knowledge: A microgenetic perspective. *Reading Research Quarterly, 43*, 206-226. DOI: https://doi.org/10.1598/RRQ.43.3.1

Siegler, R. S. (1996). *The process of change in children's thinking.* New York, NY: Oxford University Press.

Siegler, R. S. (2006). Microgenetic analysis of learning. In D. Kuhn, R. S. Siegler, & W. Damon (Eds.), *Handbook of child psychology: Volume 2* (pp. 464-509). Hoboken, NJ: John Wiley & Sons.

Singer, J. & Willett, J. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford Scholarship Online. https://doi.org/10.1093/acprof:oso/9780195152968.001.0001

Suggate, S., Pufke, E., & Stoeger, H. (2016). The effect of fine and grapho-motor skill demands on preschoolers' decoding skill. *Journal of Experimental Child Psychology, 141*, 34-48. DOI: https://doi.org/10.1016/j.jecp.2015.07.012

Tolchinsky, L. (2016). From text to language and back: The emergence of written language. In C. A. McArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (2nd ed., pp. 144-159). New York, NY: The Guildford Press.

Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen, R. S., & Denckla, M. B. (1996). Cognitive profiles of difficult to remediate and readily remediated poor readers: Early intervention as a vehicle for distinguishing between cognitive and experiential deficits as basic causes of specific reading disability. *Journal of Educational Psychology, 88,* 601–638. DOI: https://doi.org/10.1037/0022-0663.88.4.601

Wagner, R., Puranik, C. S., Foorman, B., Foster, E., Wilson, L. G., Tschinkel, E., & Kantor, P. T. (2011). Modeling the development of written language. *Reading and Writing, 24,* 203-220. DOI: https://doi.org/10.1007/s11145-010-9266-7

Watanbe, L. M. & Hall-Kenyon, K. M. (2011). Improving young children's writing: The influence of story structure on kindergartner' writing complexity. *Literacy Research and Instruction, 50,* 272-293. DOI: 10.1080/19388071.2010.514035

Yaden, D. B., & Tardibuono, J. M. (2004). The emergent writing development of urban Latino preschoolers: Developmental perspectives and instructional environments for second-language learners. *Reading and Writing Quarterly, 20*, 29-61. DOI: https://doi.org/10.1080/10573560490242723